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DEVOTED TO THE INTERESTS OF

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AND

GENERAL SCIENCE.

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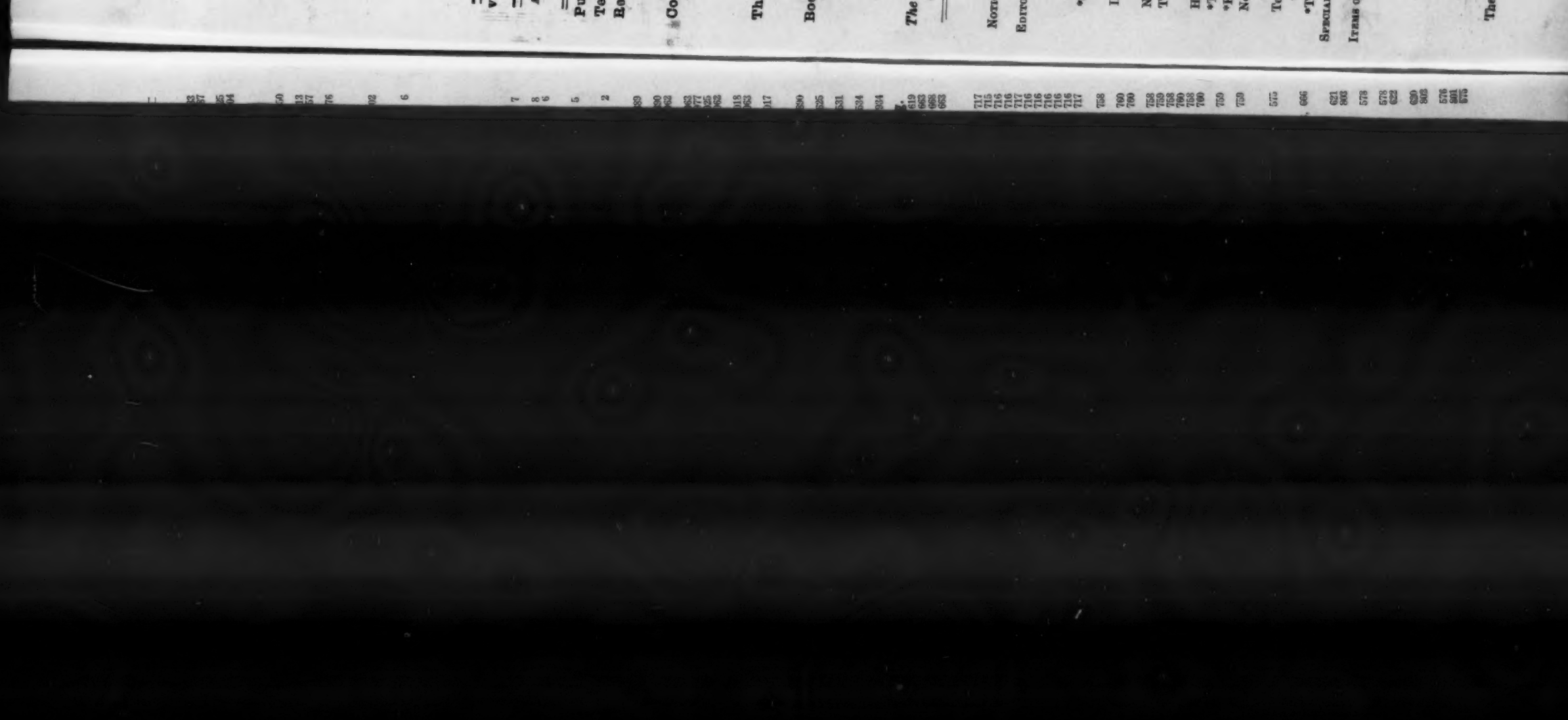

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[NOTICE.]

Wrinkle Department, the American Gas Institute.

To the Membership, American Gas Institute: All members of the American Gas Institute, and others interested, are requested to contribute a description of any novel device or scheme covering any feature of the gas business. Every department of every company uses some novel stunt which would be of value to others. The object of this department is to compile such information. The value of the report depends entirely on the co-operation received. Send in your contribution at once to

MILAN R. BUMP, Editor,
60 Wall street, New York.

BRIEFLY TOLD.

THE EVOLUTION OF RAILWAY CAR LIGHTING.—In our issue for June 17th we published an article on "The Evolution of Railway Car Lighting," by Mr. George W. Pearce. Now we have to say that while we gave credit to the author for his excellent narration we quite forgot to say that he prepared it especially for the "Illuminating Engineer." The omission was unintentional and we gladly make the credit to the proper source, and we further congratulate Editor Elliott and author Pearce for the securing and preparing of an article that is at once interesting to the lighting engineer and to the layman.

THE LEASE WILL NOT BE ABROGATED.—"J. F. W.," in an editorial correspondence, dated the 25th ult., had this to say: "The question of abrogating the U. G. I. Company's lease of the Philadelphia municipal gas works was to all intent finally disposed of in City Councils last week when that body accepted the report of its sub-committee on gas. The finding and presentment were unfavorable to the termination of the lease, and therefore, although Philadelphians may still have to keep on bathing in liquid mud, they are certain to get good gas for the next 20 years. With the acceptance of this report the Lewis ordinance directing the Mayor to take the necessary steps to terminate the lease were disposed of in *sano sensu*. On January 1st prox. the city will have its rebate increased from 10 to 15 cents per 1,000 sold, and there is now an ordinance in Councils, to be acted upon next fall, to give the gas consumer the benefit of at least some of the rebate. To do this may mean an increase of 10 cents in the tax rate (now $1.50), but those who urge the reduction say this is fairer than to make the gas consumer bear an unjust proportion of the taxes which he now does while the electric light user goes free."

OBITUARY NOTE, MR. GEORGE S. CLARKE.—With deep regret we report the death of Mr. George S. Clarke, who passed away at his home, 3401 Charlotte street, Kansas City, Mo., the morning of June 8th. Deceased had been in poor health for some years, and the culmination was in an apoplectic stroke. Mr. Clarke was born in Bloomington, Ills., September 28, 1858, and in 1872 became identified with the old Kansas City Company in a very humble position. Alert and responsive to tuition, and watchful of opportunity, he gradually improved his standing. In 1889 he became Assistant Superintendent of the Company, and in 1891 he was appointed Superintendent. During the many changes recorded in the ownership of the corporation, and all

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through the celebrated Snyder gas invasion of Kansas City, which resulted in the formation of the present Kansas City, Missouri, Gas Company, Mr. Clarke was always faithful to his charge. In 1905 he was appointed Chief Engineer of the Company, but failing health towards the close obliged him to relinquish continuous active work. His employers, however, in acknowledgment of his long and faithful service, created for him the position of Consulting Engineer, and such was his rank at the time of his death. He is survived by his father, three brothers and a daughter – two of his brothers are prominent in Missouri's newspaper fields. The gentleman to whom we are indebted for the main facts in this narrative (Mr. Thomas G. Hill, of St. Joseph, Mo.) possibly may best express the esteem in which he was held by his intimates, when he writes: "My sentiments will certainly express those of many others when I say he was esteemed, yes, loved by all with whom he came in personal contact. His death will be deplored by his many friends amongst the men who served under him, and thus knew him as he was in his everyday life and way."

CURRENT COMMENT.—

"R. L. W.," writing from St. John, N. B., under date of the 27th ult., said: "The annual meeting of the Fredericton Gas Light Company was held about a fortnight ago. The annual reports showed that large expenditures had been made on betterment account, which expenditures were in large measure to be credited with the round increase scored in the Company's business. A dividend of 6 per cent. was declared and the following officers were elected: Directors, John A. Edwards, F. P. Thompson, W. T. Whitehead, John McCarthy and F. J. Morrison; President, John McCarthy; Secretary-Treasurer, F. J. Morrison."

WE congratulate the gas industry of Massachusetts over the reappointment by Governor Guild of Mr. Forrest E. Barker to the Massachusetts Board of Gas and Electric Light Commissioners, on which Board he has capably served almost from its formation well over a score of years ago. His appointment is an earnest of the Governor's well chosen words of general moment to the gas industry of the Bay State, when he welcomed the New England Association of Gas Engineers at the annual meeting in Boston last February. No matter what those least in his favor may say regarding Commissioner Barker, none may truthfully say that he is other than a capable Commissioner and an honest man.

THE adjourned meeting of the Consolidated Gas Company, of New York, was readjourned to the 30th inst.

THIS year the annual excursion of the employees of the Western Gas Construction Company, of Fort Wayne, Ind., will be held the 20th inst. Rome City is to be the objective point, and the master of affairs is that clever organizer, Mr. Wm. G. Kaiser.

THE Kentucky Heating Company, of Louisville, Ky., which is presumed to "do a heating supply business only," has issued a statement the gist of which is that 5 cents per 1,000 cubic feet is meant by the new schedule. A resident of Louisville, however, figures it out in reality this way:

"A most peculiar feature is developed by the following comparative statement of the charges under the old and new scales for prices:

Cubic Feet.	Gross.	Net.	Net per 1,000 Cubic Feet.	Net.	Net per 1,000 Cubic Feet.
100	44	39.6	396	40	400
300	55	49.5	165	50	107
700	66	59.4	85	60	86
1,000	77	69.3	63	70	63.6
1,300	88	79.2	60.9	89	61.5
Over 1,400	..	....	59.4	..	65
	Old scale.			New scale.	

"The larger users will pay 65 instead of 59.4, about 10 per cent. increase. The meter tax of 40 cents per month during summer remains the same, so that a great many consumers will not have their eyes opened till winter. The man who uses 1,300 cubic feet will get a lower rate per 1,000 than the man who uses more than 1,400. So will the man who uses only 800. This is absolutely unique. The rate will decrease the more you use until 1,300 feet are burned, then the rate jumps up to 65 net. The man who formerly paid a bill of 66 cents gross (59 net), now pays practically the same, but the man who paid at the rate of 66 per 1,000 (net 59.4), now pays 65 net; a discrimination against the larger users; the winter time users. I have not at hand figures giving gross earnings of the Company, consequently I cannot estimate the effect upon the combined consumers of the city. I have not seen a recent statement of the operating expenses, so I cannot attempt in this short card to discuss the equity of the advance, but if convinced that it is reasonable and just, the people of Louisville will not complain. They will not murmur at a just tax of a hundred thousand, but they will censure and resent a surreptitiously discriminative assault—a midwinter plunder under cover of a midsummer sun."

Standard Methods in Service, Meter, Appliance and House Fitting.

[Prepared for the Third Annual Meeting of the Iowa District Gas Association by MR. G. I. VINCENT, Des Moines, Ia.]

In compiling data for standards for service and meter and appliance connections the writer has drawn largely from the published experiences of others, particularly the answers to the questions of the "Practical Class" of the American Gas Institute. The practices shown in these answers, and in fact in most of the literature on the subject were, however, developed largely through distribution work in large cities, and the writer has introduced a number of modifications which have been found more applicable to towns and cities of the Middle-West. The work is neither complete nor final, and it would seem there was in this subject sufficient work of interest to this Association that a committee might be appointed to continue it.

Before taking up the matter in detail let us consider the subject of standards in general. The question is often raised as to the value of standardizing work, particularly when applied to such a highly varied industry as gas pipe fitting. There is no question in anyone's mind about the value of certain general standards, as, for example, the U. S. standard screw thread and pipe thread. The principles underlying the standardizing of any work are precisely the same as the standard thread – both are processes of evolution with ultimately greater economy as the final goal; and it is the opinion of the writer that the adoption of standards in fitting work will necessarily result in greater economy, both in installation and operation. However, we have as yet no standards, and their development, particularly in this section of the country, is not very far along. The methods to be given in this paper should, therefore, not be called standard, for while they are largely developed, through long and good engineering practice, they are still open for discussion.

Service Fitting.—The standard service connection is shown in Fig. 1.

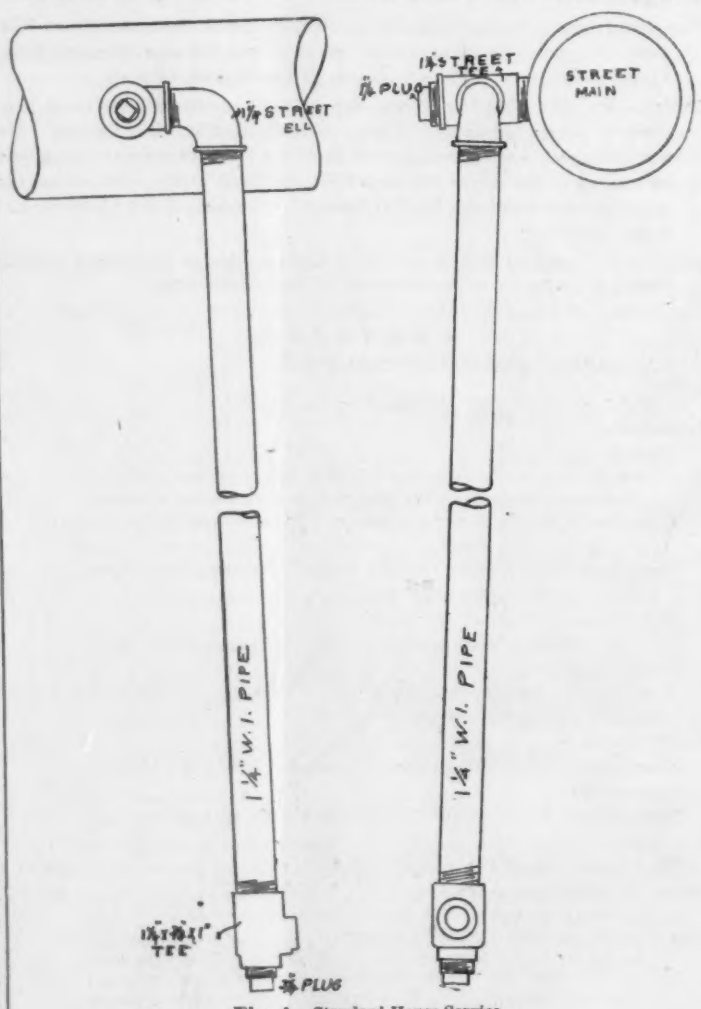


Fig. 1.—Standard House Service.

The advantages of this form of connection have been given very often but may be mentioned again briefly:

1. The swing-joint gives the grade to the service without straining the pipe or fittings and gives a slight flexibility to the service in use.

2. The plug in the street tee enables the gas to be shut off during installation until the service is completed.

3. The plug in the street tee gives a cleanout at the street end for bad stoppages.

4. The plug at the house end gives a cleanout for all ordinary stoppages.

The sizes given in Fig. 1 are for ordinary services. It is now generally admitted that it is poor practice to run smaller than 1¼-inch services. For larger sizes the same method should be used, but the plug at the house end should always be ¾-inch or bushed to ¾-inch. This is to give a uniform size for connecting a force pump. For connecting to the side of the main use the same swing joint with the ell laid parallel to the tee.

It is poor practice to drill large holes in small mains, and where necessary the main should be strengthened by a split sleeve. It is customary, and good practice to sometimes drill a smaller hole in the main than the size of the service in connecting to small mains, but in this case the reduction should be made in the male end of the street tee only. A schedule of service connections is given in Table No. 1.

TABLE NO. 1. Schedule of Service Connections.

Size of Service Inch	Size of Main Cast Iron Inches. 20	16	12	10	8	6	4	3	2
	Size of Hole, Inches.								
*1	1	1	1	1	1	1	1	3/4	1 1/2 SS
1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1	3/4	1 1/2 SS
1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 SS	1 1/2 SS	1 1/2 SS
2	2	2	2	2	2	1 1/2	2 SS	1 1/2 SS	1 1/2 SS
2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2	3 SS	2 SS	3x3T	---
3	3	3	3	2 1/2	3 SS	3 SS	4x3T	3x3T	---

1 1/2 SS = Split Sleeve tapped with 1 1/2" hole.
3x3 T = 3x3 cast Iron Tee, main to be cut and tee inserted.
* = For street lamp service only.

Service split sleeves are standard castings and come in all sizes from 2 inches to 8 inches. To avoid multiplication of fittings, a full line of sizes of tap holes is not provided for each size main and bushings are used to reduce where required. In place of the service split sleeve, an ordinary split sleeve, as used for repairing leaks tapped to the size required, may be substituted.

In connecting services to wrought iron, low pressure mains, the main may be either cut out and a fitting inserted, or a sleeve or saddle used. Cutting the main is satisfactory only for small mains, say 2 in. and less. It is poor practice to drill and tap a hole in wrought iron pipe. Drips on services should be placed outside of the building for two reasons.

1. Danger of freezing and bursting inside; (2), annoyance caused by possible spilling of the liquid when emptying.

Fig. 2 shows a good form of service drip. Use tees with plugs in turning right angles in services instead of ells. Curb cocks, if used, should be set uniformly either at a fixed distance from the building or a fixed distance from the curb. A heavy, all-iron stop-box, with large inside diameter and loose cover without a screw, is preferable to a light, small iron box or a part wood one. Curb cocks on services are of doubtful utility in towns and cities similar to those in our three states. This is excepting large services and services in the business section of the town.

Only beaded, malleable fittings should be used for service work. Galvanized fittings are better than black, and recessed fittings better than plain. In other words, the best fitting to use for service work is a recessed, galvanized fitting. These, however, cost about twice as much as beaded, black fittings. Galvanized fittings cost about 50 per cent. more than black. A recessed fitting is one which is counterbored so that when the pipe or nipple is screwed home the threads are completely covered.

Meter Fitting.—The long controversy over lead versus iron meter connections seems to have settled down to a compromise of iron inlets and lead outlets on small meters, and all iron on large meters. The lead outlet gives the required flexibility to reduce strain on the columns of the small meters.

Fig. 3 shows an iron inlet connection, and Fig. 4 a lead outlet connection. The iron inlet is identical for 3, 5 and 10-light meters as far as the ell in the outlet of the 3-inch cock. This style of connection is particularly desirable where no curb cocks are used on the service, for the meter connection can be run as far as the cock when the service is installed and the cock plugged. The connection can then be completed when the meter is set. If a lead inlet is used under the same circumstances there is a possibility of its being wrenched off and

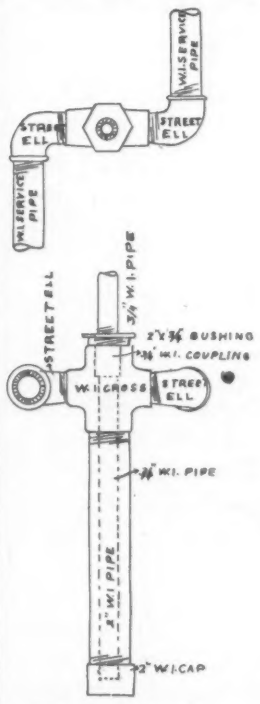


Fig. 2.—Service Drip.

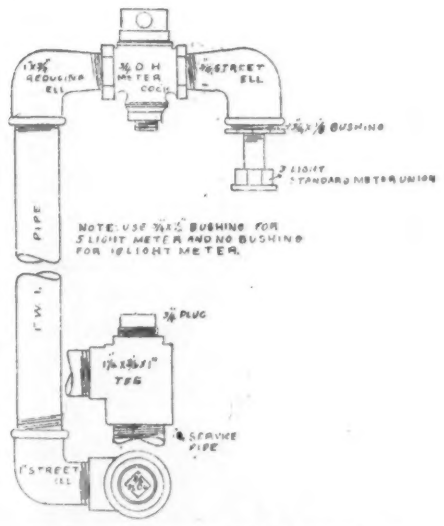


Fig. 3.—Inlet Connection for 3-5-10-Light Meters.

stolen before the meter is set, and this applies particularly to new houses. For the above style of meter connection, a one-threaded and one-solder joint meter union is required for each meter. The meter companies will supply these on order. The lead outlet connection needs little comment. This form, with the union inserted in the end of the lead pipe, has so many advantages over the old style, with the union inserted in the pipe at right angles to the center line of the pipe, that the latter seems to have no reason for existence.

Fig. 5 shows an all-iron inlet connection for meters of 20-light and over. Particular attention is called to the full-swing joint which requires more fittings, but enables a much more accurate fit to be made to the meter and also makes a ready alteration possible for meters of different widths. With this style of connection and reasonably careful fitting there should be no strain whatever on the meter columns.

It is good practice where a number of meters are required for different consumers in one building to connect them all to one service. The meters in this case should be kept in an even line and connected to one header run from the service. Fig. 6 shows a header so designed that it can be extended. All meters, whether large or small, should be supported at the bottom and never hung from the connections. Meters should be set at or within sight of the head of the service.

House Piping.—So much work has been done on this branch of the subject that it seems useless to repeat. The rules to follow are extracted from those recently adopted in several cities, which were compiled with slight changes from other standard practice. The principal criticism will no doubt be upon the large size of piping required. Extensive experience has shown that this is in no sense excessive.

1. The piping must be tight under a pressure of 10 inches of mercury column when completed, and after the piping is closed in and before the fixtures are hung.

2. The size of pipe shall not be less than those called for in Table 2.

3. No house riser shall be less than ¾-inch.

4. No house pipe shall be less than ⅝-inch.

5. No branching for stove line shall be smaller than ½-inch.

6. Gas is never to be supplied from a smaller pipe to a larger one.

7. No pipe smaller than ¼-inch to be used between outlet of meter and outlet of range.

8. Pipe must be free from obstructions.

9. The use of cement for repairing leaks is strictly prohibited.

10. Of any given sized pipe, do not run a longer length than the longest length given in the table for that size, but if for the required number of outlets the length required is longer than that required in the table, the size may be increased with a reducing coupling and continued with the next size larger pipe. For example, suppose that it is required to supply 8 outlets through 80 feet of pipe. Referring to the table it is found that 8 outlets can be supplied through 13 feet of ¾-inch pipe, 50 feet of 1-inch, 100 feet of 1¼-inch, and so on. The 8 outlets in the example can, therefore, be supplied by 80 feet of pipe, consisting

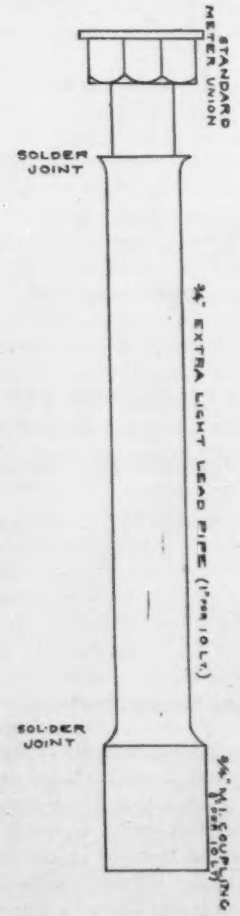


Fig. 4.—Lead Outlet for 3, 5 and 10-Light Meters.

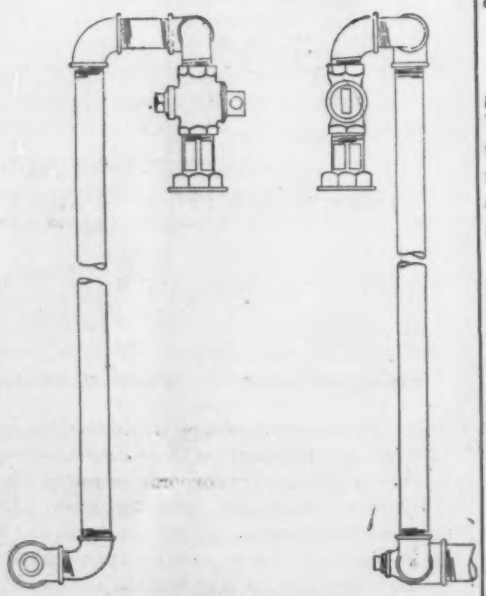


Fig. 5.—Standard Inlet Connection for Meter 20-Light and over.

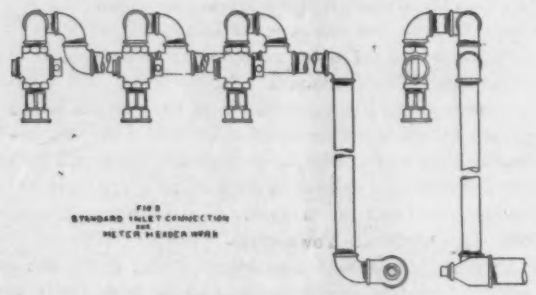


FIG 6
STANDARD INLET CONNECTION FOR METER HEADER WORK

TABLE NO. 2. House Piping.

Outlets	3/8" Pipe	1/2" Pipe	3/4" Pipe	1" Pipe	1 1/4" Pipe	1 1/2" Pipe	2" Pipe	2 1/2" Pipe	3" Pipe
1	20	50	50	70	100	150	200	300	400
2		27	50	70	100	150	200	300	400
3		12	50	70	100	150	200	300	400
4			50	70	100	150	200	300	400
5			33	70	100	150	200	300	400
6			24	70	100	150	200	300	400
8			13	50	100	150	200	300	400
10				38	100	150	200	300	400
15				21	60	150	200	300	400
15				16	45	120	200	300	400
20					27	65	200	300	400
25					17	42	175	300	400
30					12	30	120	350	400
35					1	22	90	270	400
40					1	17	70	210	400
45						13	55	165	400
50						2	45	135	330
65							27	80	200
75							20	60	150
100								35	80
125								22	50
150								15	35
175									28
200									21
225									17
250									14

of 17 feet of 1¼-inch, 50 feet of 1-inch and 13 feet of ¾-inch, using reducing couplings at the junctions.

11. In figuring out the size of pipe, always start at the outlets or extremities of the system and work towards the meter.

12. White lead or other joining material should be used sparingly so as not to clog the pipe.

13. The riser must be extended to a point within 18 inches of the proposed location of the meter, and to right of same.

14. Risers should not be scattered, but should drop together in alignment to the basement.

15. No elbow should be put on the bottom of any riser, but the bottoms of all risers should have a tee.

16. In making outlets always use fittings; do not bend the pipe.

17. Unions should not be used in concealed work.

18. Long runs of horizontal pipe should be firmly supported at short intervals to prevent sagging.

19. All branch outlet pipes should be taken from the sides or tops of running lines; never from below. Bracket lines should be run from below when practicable.

20. House pipes should be so run and covered as to be readily accessible.

21. Risers should be run in partitions in preference to outside walls.

Appliance Fittings.—The connections of appliances present such a great number of variations that it is impossible to go into detail. The bulk of appliances consists of stoves and water heaters, and even in these the variety prohibits standardizing, but does admit of general rules, many of which have been covered under "House Piping," and attention is called to Rules 1, 7, 8, 9, 12, 17 and 18, which it is unnecessary to repeat here.

Sixty feet of ¾-inch pipe will deliver about 100 cubic feet of water gas per hour with .3 drop or about 110 cubic feet of coal gas. As an ordinary double oven range will use 100 cubic feet of gas an hour, all on, nothing under ¾ inch should be considered for connecting gas ranges. Further, when it is considered that water heaters when installed are connected to the stove line, it is a question of whether 1-inch pipe would not be better, particularly for long runs. It is conceded that a uniform size for all lengths is the most preferable, and as the difference in cost between ¾-inch and 1-inch pipe is only a trifle over 1 cent per foot, there seems to be a fairly good argument for using 1 inch exclusively.

Where it is necessary to drip the stove line away from the meter, it should be equipped with a drip at the lowest point made from a nipple 6 inches long and provided with a hose cock or other small opening cock, and not with a cap or a plugged coupling. The drip should only be installed in a place readily accessible and protected from freezing.

The question of installing a shut-off cock with each appliance is an open one; also the location of the cock, if installed. The one argument in favor of a cock is the means given to control the gas in case of accident to the appliance or to make repairs. Any cock should, therefore, be placed at the appliance and not at the meter. As a general proposition, it is good practice to install cocks on all industrial appliances and omit them on domestic appliances, the argument against their use in the latter case being briefly the additional expense and danger of misuse by the consumer with possibility of exploding the appliance.

Gas stoves with back-flue outlets should not be placed closer than 8 inches to a wall. In disconnecting stoves the riser through the floor should be screwed out and the line plugged below. This is to prevent possible injury to occupants by tripping over the pipe.

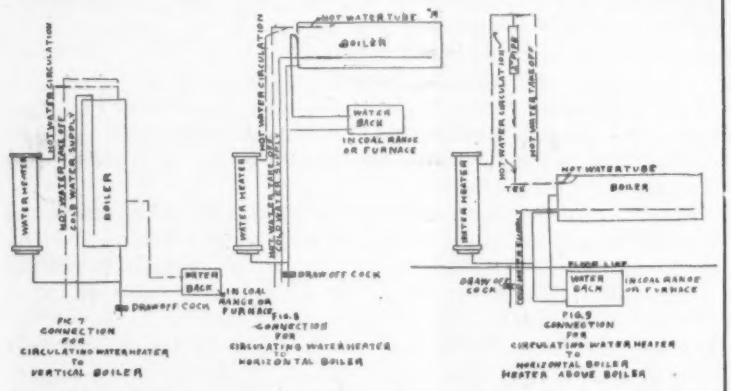
The appliance next in importance to the gas stove is the water heater. While water heaters are of two classes, circulating and instantaneous, with two types of the latter, the same general rules for connection apply to each.

The connection should be directly from the meter. Circulating heaters can generally be connected to the stove line. If there is none in use, one can be installed for the heater connection and the stove connected later. Instantaneous heaters of the pressure type, such as the Ruud and Monarch, should be connected with the size pipe given by the manufacturers, but never with less than ¾ inch. Instantaneous heaters of the open type should have a direct line not less than ¾ inch. The connection of any type to an outlet will usually result in trouble. The flue pipe of all heaters should be run to the chimney or out doors. The practice of ending the flue pipe in a disused room, or garret or cellar way is a poor one and saves very little in the installation. All water pipe and fittings should be galvanized and of the size called for by the manufacturer, but never less than ½ inch.

Circulating water heaters occasionally present some difficulties in their installation, and it seems to be quite usual to decline to connect them to horizontal boilers of any type. This is unnecessary loss of business, as a circulating heater can be made to give results with any kind of boiler in any location.

Fig. 7 shows a standard connection to a vertical boiler. Fig. 8 shows a standard connection to a horizontal boiler when the heater can be set below the boiler. This requires usually the insertion of the

bent hot water tube "*A*." Fig. 9 shows a connection to a horizontal


HOT WATER TUBE
BOILER
WATER BACK
IN COAL RANGE OR FURNACE
WATER HEATER
DRAW OFF COCK
FIG 7 CONNECTION FOR CIRCULATING WATER HEATER TO VERTICAL BOILER
FIG 8 CONNECTION FOR CIRCULATING WATER HEATER TO HORIZONTAL BOILER
TEE
FLOOR LINE
FIG 9 CONNECTION FOR CIRCULATING WATER HEATER TO HORIZONTAL BOILER HEATER ABOVE BOILER

boiler when the heater is placed above the boiler. This method is used where the boiler is low and should be used in preference to setting the heater in the cellar or basement where it would be subject to freezing.

Gas engines should always be installed by the gas company and not by the agent or salesman. Table No. 3 gives the size meter and connection line. A separate meter should be used and an independent line run in all cases. The exhaust should be one size larger than the tap on the engine, and should have the minimum number of turns with sweeps instead of elbows for turns. A gasometer with oil for the liquid and a stop to prevent blowing is preferable to a rubber bag. In small towns where it is not possible to employ an experienced gas engine man a hot tube is preferable to an electric igniter, but if an electric igniter is used the negative pole of the battery should be connected to the insulated side of the spark plug and the coil inserted between the positive pole and the ground side of the spark plug. City water with a slight overflow is preferable to tank water. If a circulating tank is used, allow about 50 gallons per hour horse power, and install a float or tell-tale on the tank to be sure that it is full.

TABLE NO. 3. Size of Meter and Connection for Gas Engine. Connection 150' long or less.

Engine Horse Power.	Size Meter	Size of Pipe. Size	Length	Size	Length
1- 4	5	1	150		
5-	10	1	100	1 1/4	50
6- 8	20	1 1/4	150		
9-10	20	1 1/4	50	1 1/2	100
11-12	30	1 1/2	150		
13-14	45	1 1/2	100	2	50
15-20	60	1 1/2	50	2	100
21-30	100	2	100	2 1/2	50

Run no greater length of any size than that shown in the first column of lengths. For example to connect a 5 H. P. engine with a line 120' long, use 20' of 1 1/4" pipe and 100' of 1".

Other industrial appliances are too widely varied in character to admit of detailed discussion. As a rule all of these appliances have been developed along the most scientific lines by skilled manufacturers, and as their installation is comparatively rare in the smaller cities, the writer would advise correspondence direct with the maker of the appliance in regard to size and method of connection. They will also advise the size meter required, and to check this Table No. 4 is inserted, which is copied direct from the answer of the Trustees of the Practical Class of the American Gas Institute. It is conservative and most makers' meters, particularly 30-light and under, will pass more gas than that shown.

In all of the above some difficulty has been found in adhering strictly to the subject of installations and avoiding entering into the discussion of the operation, which accounts for some of the lack of detail. The line between the two is not well defined and it will probably have to be overlooked in many cases in preparing complete and detailed standards.

TABLE NO. 4. Average Capacity of Standard Dry Meters in Cubic Feet per Hour.

Size	With 3/10 loss	With 5/10 loss:
3	40	55
5	50	75
10	80	120
20	115	160
30	175	270
45	215	315
60	330	475
100	385	600
150	---	1015
200	---	1380
300	---	1635

In conclusion, the writer wishes to thank the gentlemen who have so kindly furnished much of the data incorporated in this paper.

Discussion of the Proper Attitude of Gas Companies Towards the Public.

[Prepared for the Third Annual Meeting of the Iowa District Association by MR. JANSEN HAINES, Des Moines, Ia.]

Forty years ago public service corporations were granted charters by special enactments of the State Legislatures. In England to-day such charters are granted by special act of Parliament. In this country at present there are, in most of the States, general laws that apply to the incorporation of all public service corporations, and prescribe the methods of incorporation and certain limitations which vary in the several States. In the newer States the statute usually provides for the referendum, and limits the length of the charter or franchise. It is naturally the rule that the gas companies incorporate in the State in which they are doing business. Most of the States, by suitable legislation, reserve the right to regulate or limit their operations in point of time and extent of territory. This has now been the custom for so long that the people in any community look upon a gas company, or other public service corporations, as more of a creature of the State than a corporation for manufacturing or trading; as, for instance, a shoe factory or drygoods store.

This close relation of a gas company, in its occupation of the public streets and other ways, to the State and municipal government has very naturally lead to the idea of municipal ownership with its record of consistant failure both here and abroad. Keeping in view this association of a gas company with the body politic, what should be the "Gas Company's Attitude Toward the Public?"

In the first place, it is true that the rights and privileges of a gas company are granted by the State, and while in this it does not differ from any other corporation, its customers are such a large proportion of the people in the municipality in which it operates, and its business with each is so vital to their comfort, that its operations differ from other manufacturing and trading corporations. To the public mind this position of the gas company appears as a monopoly, or a business which is free from competition.

To the gas manager the fallacy of no competition is at once apparent. In the lighting field, electric light, oil, and even the old-fashioned candle are constant sources of the keenest competition, and in the fuel field, coal, wood, gasoline, oil and electricity have certain advantages which must be overcome to convert the consumer to the use of gas.

It is also true that, in its occupation of the streets and public highways with its mains, a gas company at times must cause temporary inconvenience to the traveling public from whom it receives its right to do business, and from whom it derives its business, and who, in turn, benefits by its service. Now, it is apparent that every act of a gas company should carry with it the responsibility of the rights conferred in its contract with the municipality, and this responsibility implies the duty to carry out the letter and spirit of this contract to serve the public. Unnecessary inconvenience to the traveling public, by being careless or negligent in the protection of its trenches in the street, or by improperly restoring the pavement or surface of the street, is an intolerable violation of its duty to the public. The use of an inferior quality of material in its mains or pipes, leaky joints, and even mains that are too small to properly provide for future growth, are also violations of the duty of the gas company. These questions are largely relative and depend much on the experience and skill of the

men employed; but it is the duty of the gas company to see that the best and most experienced men are employed to design its systems and construct its plant, and that their methods and workmanship are up-to-date in every respect.

I will not attempt here to define in detail the duty of the gas company in all this construction work, but the principle outlined above serves to illustrate my point. The gas business is not so new but that there are certain standards of construction which are the result of experience which has been obtained by men whose lives have been devoted to the development of the scientific principles involved, its chemistry and its engineering. The experience of these men is generally available in the records of the proceedings of the various Associations and in the engineering magazines, and it is the duty of those who are serving the public in supplying gas to take every means in their power to obtain for themselves the fruits of this experience and then make the proper application to their own individual plant.

Now, one word in regard to the quality of gas furnished. In some places this is unfortunately regulated by statute. I say unfortunately, because if the gas company has assumed the proper attitude towards the public such regulation is not necessary and may hamper the proper development of the service to the public which should be along strictly commercial lines.

To the gas company which has been less fortunate in its policy this regulation is frequently imposed as a species of retaliatory measure and agitated by demagogues to prejudice the mind of the public and who are very naturally ignorant of the scientific principles involved. From the standpoint of the real economic principle, it is obvious that the goodwill of your customers can only be retained by furnishing the best product possible at the lowest price. It is the duty of the gas company to thoroughly study its own problem in the honest interest of its consumers. For instance, the question of whether it is better to supply a high candle power water gas, because it may be better used with the open flame, or a low candle power coal gas, because it will furnish a more economical illumination with the incandescent mantle.

Having given the various determining questions a careful study, it is up to the gas company to win for itself the confidence of the public by its consideration for them in the detail of its daily transactions with them, that they will see the value to the community of a well conducted gas business in which the greatest benefits of the service to the public will be obtained, and at the same time a fair profit may accrue to the capital invested by the company.

A short time ago a committee of citizens and city aldermen from a neighboring town called on me and asked my advice as to how they should proceed against the gas company supplying them. They told me that the service was very poor and that they could get no satisfaction from the owners of the property; therefore, they had decided to reduce the price of gas to what I at once recognized would be an unprofitable figure.

My advice to them was to allow a price sufficient to warrant a fair profit to the company, but to pass the necessary laws to insure the best service and permit nothing else. The illogical feature of the penalty they proposed was made clear to them and they are now working in better harmony; but the gas company was responsible for the position in which it found itself because it had failed to recognize its duty to the public.

Another case I might mention was that of some men engaged in the gas business who sought to obtain a franchise in another city not supplied with gas. These men were known by the conscientious fulfillment of their obligations to the public in their business at home, and when their franchise was presented to the people it was granted by a vote of 25 to 1. So much for the questions of construction, quality and price.

One of the most important features of success is goodwill. This is quite as intangible as the "unearned increment," but is distinct from it. Goodwill is essential to any business, but in the gas business it should be one of the prime movers in every act.

The complaint clerk, the cashier, the manager, the secretary or superintendent, all come in daily contact with the public more or less, and they should keep in mind constantly that their duty is to serve the public first and at the same time conserve the interest of their stockholders or employer. The public always expects generous treatment as an evidence of good management of a public service corporation. Don't misunderstand me. By generous I don't mean extravagant treatment; I mean that the public expects a dollar's worth for a dollar and requires patient attention and diligence as a part of the evidence to prove that it is getting that for which it asks from those who serve it. Let the average man realize that a gas company is taking every pains to give him good service and good gas, let him find that it is trying to help him keep his bills as small as possible, and he will be the friend and supporter of the company's management because his confidence is settled.

I believe that it is not necessary to simply carry on the gas business along mathematical lines, but that every employee, from the president of the company down, should be made to realize that their duty is to serve the public and that their service should be rendered with courtesy and patience.

Certain rules and regulations must be adopted for the conduct of its business by any company, and when these rules are misunderstood by the customer it is the duty of the company's employees to explain them politely and cheerfully to the satisfaction of the customer.

If a customer has lost his bill and requests the bookkeeper to furnish another, it should be done not because it is necessary or demanded but willingly and without reproof. If a customer or stranger asks the use of the "City Directory" for a minute at the counter, or to change a bill at the cashier's desk, this service should be rendered cheerfully and with good feeling, for while it is not technically the business of the company, yet, as a public servant, the employee should feel it his pleasure to accede to such a trivial request and show the spirit of the goodwill of his company.

In conclusion, what I want to impress is it should be borne in mind at all times that the gas business is an honorable business which deserves its rights at the hands of the people, and that in return it must render the best service at the least cost, not only because it is the best policy to do so from purely business reasons, but because there is a moral obligation upon the company to do so.

New Business.

[A paper prepared for the Third Annual Meeting of the Iowa District Gas Association, by Mr. A. W. Zahm, Mason City, Ia.]

Much has been said and much has been written on this all-important subject within the past few years. Managers take a keener interest in this than in technical subjects, and a number of our Associations have spent more money and given more time to this department than to any other. It is in fact the keystone upon which every other department is more or less dependent. In the larger companies this is entrusted to a special manager who is thoroughly trained for this work and who supervises the work of his assistants, but in the smaller companies this work often devolves on the general manager.

System is an important factor and can hardly be overdone. The first and all important work is to get up your list of prospective customers. This should be entered on a blank form, the territory being divided into districts and carefully tabulated. An insurance map showing the location of every building in your city is an excellent way of tabulating the services installed and location of mains. The prospective customer should be entered on a card index arranged according to street and number. Space should be left on these cards to enter the date of each call, name of solicitor making call and the result. If requested to call at a future date this should be entered in your "Daily Tickler," to avoid forgetting.

Letters and advertising matter should be sent out at intervals of 2 weeks during the busy season, describing the advantages of "Cooking with Gas," "Gas Water Heaters," "Gas Lighting Appliances," etc. State your proposition in as few words as possible, making it direct and to the point. Whereas this does not often bring direct results, it is of material assistance to your solicitor. Be sure and call attention to your easy payment plan of purchasing gas ranges. This method has become very popular and has been the means of securing consumers among a class of people who have not the means of purchasing a gas range outright.

Solicitors for this kind of work need have no special training; the main requisite being hustle and push. They should, however, be scrupulously neat in appearance and of a pleasing address. A list of all calls made each day should be insisted upon and carefully looked over by the department or general manager. These daily reports should be kept on file for future reference. The actual business secured by each solicitor should be tabulated and a comparative statement of the various solicitors posted each week. This stimulates them to be at the top of the list and causes considerable friendly rivalry.

Reports of unused services should be made out each month and given the solicitors to ascertain why they are not using gas; also, minimum charge customers or customers using less than $1 worth of gas per month. These consumers can often be induced to install additional appliances to increase their consumption.

Complaints can also be handled to the best advantage through the new business department. Their efforts should not cease upon landing a new customer, but should look after the old customers' complaints as well. A complaint should receive very prompt attention as a customer's good will is a valuable asset. Have your customers' "Complaint Expense" account liberal. Do not charge for every slight repair or adjustment, but bear this expense yourself. A good method is to have some competent lady demonstrator call on each customer shortly after a range is installed to explain in detail the method of baking and broiling, thereby increasing the consumption of gas. It is really surprising to find out how many housekeepers using a gas range do not understand the use of the oven or broiler.

Have your office centrally located and nicely equipped with all of the various gas consuming appliances. A display room adds very materially to your sales if artistically arranged. Consumers usually visit the office to pay their bills and will often purchase gas novelties which will add materially to their consumption.

Newspaper advertising keeps the company before the public and acts as a constant reminder. Use cuts in addition to reading matter, as they attract attention. It also brings about a friendly relation with the Editor, which is of considerable value to you and will often times modify or suppress many of those sensational items which come into the Editor's hands. Do not be satisfied with an "ad." on the patent medicine page, simply because it is cheap, but insist upon space on the city page.

At all times inspire confidence in the public. Avoid rate agitation and newspaper notoriety. Every employee should wear a "booster button" and boost for the company first, last and all the time. Give good service. Do not discriminate on rates and follow up complaints, be they ever so absurd. Have an inspector to inspect the gas lights and gas arcs in the business portion of the city. It should be his duty to wash globes whenever necessary, install new mantles where needed and to promptly report any poor service of poorly lighted store. Let each customer be a constant advertisement of the excellent service that you are giving. Wage a relentless war on gasoline lighting plants. Try to indnce the storekeeper to install gas, and if unsuccessful see the landlord and explain the dangers and the increased fire hazard. "Scott's Digest" will no doubt be of assistance to you in this compaign.

Merchants follow the example of their neighbors to a large extent, and if gasoline lighting obtains a foothold it is hard to eradicate. It is usually the long hour or profitable consumer who adopts the gasoline method of lighting as a matter of economy, hence all the more reason they should be brought back into the fold. Let your slogan be, "Cook with Gas! Light with Gas! Heat with Gas," and keep everlastingly at it.

In the East where new business departments were first inaugurated they are always reaping the harvest, and in looking over the directory you will find an average annual output of from 4 millions to 5 millions cubic feet per 1,000 of population. This is largely due to the active campaign for new business inaugurated by these companies for the past few years.

The Organization of Gas Companies in Towns of Less than Ten Thousand Inhabitants.

[Prepared for the Third Annual Meeting of the Iowa District Gas Association by Mr. Geo. H. Waring, Omaha, Neb.]

From the title of this paper one might infer that it was the intention of the writer to take up the question of organizing a corporation under certain laws, together with the financing of same. Such is not the case, however, as the writer has assumed that the gas company has been organized so far as to the issuing of stock, bonds, etc. What the the writer wishes to deal with is the organization of the working force, the general operation and management of the plant.

Coleridge says: "What is organization but the connection of parts in and for a whole, so that each part is, at once, end and means." The end we wish to reach is the sale of the largest amount of a standard quality of gas at the lowest price consistent with a fair interest on the capital represented. The means by which this can be done in a small gas works has not been given the same thought that it has received in a large works.

The question that we must ask ourselves, in order to reduce the cost of our gas is, "What are the items that go to make up this cost?" In the large gas plants manufacturing materials compose about 90 per cent. of the holder cost, with a charge of 10 per cent. for labor. In the small gas works manufacturing materials amount to less than 75 per cent., and labor over 25 per cent. In the large gas works, where several men are employed, one or two extra men can give their entire time with profit to the question of getting the best efficiency out of the materials. In the small gas works one more man may increase the labor cost 100 per cent. In the large gas works daily, and even hourly, reports are necessary, whereas in a small works daily reports would cost more than could possibly be saved. The larger the gas plant the more we can afford to analyze results and the larger the force that can be employed in this work. On the other hand, the smaller the gas plant the less we can expend for this purpose, until we come to a works such as called for by the title of this paper, when the amount that can be spent must be reduced to a minimum. To illustrate the necessity of reducing the pay roll of a small gas works to its minimum, we will assume that we have a plant furnishing 200 consumers, with the total sales amounting to 5,200,000 cubic feet of gas per annum. We will suppose that we have two men employed, a manager and his assistant, the manager receiving a salary of $75 per month, the assistant, $55 per month. This will amount to $1,560 per year or 50 cents per 1,000 cubic feet of gas sold. Selling 5,200,000 cubic feet of gas per year we would have an average weekly send out of 100,000 cubic feet. Any increase in our pay roll to the amount of $1 per week would increase the cost of our gas 1 cent per 1,000 cubic feet. If we should employ a clerk to make out daily reports and keep an elaborate set of books, such as are kept by large gas works, and pay this clerk the small salary of $5 per week, we would at once increase our cost of gas 5 cents per 1,000 cubic feet. If we increase our labor charge $1 per week, and increase the cost of our gas 1 cent per 1,000 cubic feet, we can reduce the cost of our gas 1 cent per 1,000 cubic feet for every dollar per week we can reduce our pay roll charge to operation.

There are two ways of reducing our labor charge to operating. The first is to reduce the salaries of the employees – this we do not approve of; the second is to reduce the force. This can be done by utilizing our regular force in making the necessary improvements to our plant at odd times, charging this time to the improvement accounts in the place of employing extra men for this work when the regular force is engaged. There is also a large amount of work for which a charge should be made to the consumer, which can be done by the regular force, but is often done by extra men. No extra men should be employed by the company and time will be found for the regular force to do this extra work, thereby reducing the labor charge to operating. We must keep the dollar per week saving before us all the time and not give too much time to the efficient use of materials. Get the best efficiency out of materials with the least cost of labor.

Bookkeeping and clerical work should be reduced to a minimum. To conform to the "Uniform System of Accounts" of the American Gas Association, the following operating accounts are suggested: A, manufacturing; B, distribution; C, expense; D, new business; E, merchandise. The account merchandise to take the place of the accounts, storeroom, ex-storeroom and merchandise of the "Uniform System of Accounts." All material purchased, except for manufacturing purposes, should be charged to merchandise. All expense of handling this material should be charged to merchandise. All material used out of stock in the operation of the business should be charged to one of the above accounts at the inventory price of same, and a credit made to merchandise. All material for sale should be sold at a reasonable profit and the amount received credited to merchandise, so that the account merchandise should show a profit at end of year. The other four accounts as mentioned above are handled in the same way as called for by the "Uniform System of Accounts," except that there are no sub-accounts under each head. All charges are made direct to the main account.

As it is very important to know the profits each month it would be advisable to open an account "Advance Insurance," representing the amount of all insurance having been paid in advance, charging off each month to "Expense" the proportion of insurance chargeable to that month. As the taxes are not paid in advance, an estimated amount can be set aside each month for this purpose to be known as "Tax Fund." Charge off each month to "Expense" the proportion of taxes for that month. All interest on bonds or notes of any kind should be set aside monthly, and be known as "Interest Fund." The following books are suggested: Consumers' ledger, which would include the sundry sales, daily cash blotter, bank book, check book, sundry sales' blotter, merchandise stock book, monthly manufacturing record book, meter route book, general cash book, general ledger and journal. With the above books, and accounts kept as suggested, a monthly statement showing "Profit and Loss" should be very

simple to make. On account of manufacturing materials being charged direct to manufacturing, it will be necessary to take an inventory of materials on hand the 1st of each month and shown on the monthly report under "Resources." The merchandise on hand can be taken from the merchandise stock book and shown on the report in the same way. Merchandise inventory should be taken at least twice each year. An average of 2 hours each day should be all the time necessary to keep up the above set of books where not over 300 meters are in use. It is very important that these books be kept up from day to day. The manager should give so much time each day to this work and could do it in connection with serving the consumers in the office. It is not necessary for the manager to be in his office at all times, nor is it necessary to have a gas office. An arrangement could be made for desk room in some store with a small place reserved for appliances. If the works is accessible it would be much more economical to have the gas office at the works.

The manager should set certain office hours and try to be prompt in keeping them. If possible the manager should do all the collecting, meter reading and soliciting, and the three can be done in connection with each other. Any orders and complaints, if attended to by the assistant, should be inspected later by the manager to see that perfect satisfaction is given. If possible the manager should win the friendship of every consumer, and in order to do this no special friends should be made, for in a small town there are a number of cliques, and if the manager is identified with one of these the members of the others are apt to be unfriendly. All should be treated alike. One of the most difficult things for the manager to do is to make collections, as in some cases it is apt to cause feeling. It would be advisable for "cut-off" notices to be signed by the company, for it would relieve the manager of a great deal of embarrassment. The manager should give most of his time to the commercial end of the business; at the same time he should be in touch with the work of his assistant, and in case of sickness he could do the work of both by calling in an inexperienced man from the outside. In this connection it would be interesting to describe the necessary qualifications of a manager for a small gas works.

He should be ambitious to such an extent that he is determined to make the business a success in order to be able to point to the results of his efforts in obtaining a position as manager of a larger works. There is no other training as good for a young man wishing to become a manager of a larger gas plant as being a manager of a small gas works. He learns all the details of the business, which he could never learn in a large gas works. Some of the most successful managers of large gas companies to-day started as managers of very small gas companies. He should have a general idea of business and be competent to manage any mercantile or manufacturing business where goods are bought and sold. The gas business is not unlike any other business, except that the territory is restricted and the price regulated. A previous knowledge of the gas business would be a great advantage, but is the least important of the qualifications of a gas manager. A general mechanical knowledge would be very valuable; but this, as well as a knowledge of the business, can be acquired. The writer has in mind a successful gas manager of a large gas company who obtained his business training in a wholesale commission house. A technical education, with the other qualifications as above, would make an ideal gas manager; but is not essential. The technical man has his field in the large gas company where efficiency in the use of materials is most important. The smaller the gas works the less important is technical knowledge. Of course, the manager of a small gas company should be progressive and acquire all the knowledge he can obtain in a technical way. The gas manager must, however, generalize and not specialize.

He must be a good salesman. This is very important, for the development of the business depends upon his ability to sell. No matter how efficiently the gas is made it is of no value unless it can be sold. To educate the present 200 consumers in the use of appliances to the extent that each consumer will use 100 cubic feet of gas per week more than was being used would increase the sales 20 per cent. To make the same increase by obtaining new consumers would require 40 more consumers and an increased investment for a meter and service, and in some cases a main extension. The most profitable new business is to increase the consumption of the present consumer by education in the use of efficient appliances; the next is to secure a consumer where an idle service is located, requiring only a meter; third, to secure a new consumer along the line of present mains requiring a new service and meter; fourth and last, a consumer not on line of mains, requiring a main extension, new service and meter, being the least profitable new business and in some cases unprofitable. This business should all be secured, but solicited in the order as named to get the greatest returns for the least outlay. Any increase in the sales of gas will reduce the fixed charges per 1,000 proportionately. The manager should not only come in personal contact with each consumer, but he must also endeavor to make friends with every prospective consumer.

After the manager has been appointed the next thing is to select an assistant. This should be done with great care, as often the assistant must take charge in the absence of the manager. As a general rule, the assistant should be strong where the manager is weak, but each must try to learn from the other. If the manager is a good commercial man but has little practical knowledge of the physical end of the business, the assistant should be an experienced gas man in the manufacture and distribution of gas, with capacity to be able to grasp the commercial end of the business. If, on the other hand, the manager is a practical gas man with little knowledge of commercial work of any kind, he should select an assistant who has had sufficient experience in commercial work of some kind to be able to keep the books and records, and at the same time have ambition enough to improve himself by learning the physical end of the business. Both men must understand that the success of the company means their success and that the failure of the company means their failure. The manager should be broad enough to be willing to help the man under him, so that when the manager is called to the management of a larger gas company he can recommend his assistant as his successor. They should feel toward each other as partners in business, one senior and the other junior partner.

Good organization means efficient management, low cost of production, large output, large sales per meter, large sales per mile of main, large sales per capita, reading of meters on same dates each month, bills delivered promptly to consumers, collections made on date specified or service discontinued, bills charged to proper accounts, all items of expense and earnings included in month in which they belong, monthly statement of earnings furnished directors promptly, judgment in purchases of materials of all kinds, and, above all, the goodwill of the public and, if possible, the goodwill of the city administration and the local newspapers.

High Pressure Transmission.

[A paper prepared for the Third Annual Meeting of the Iowa District Gas Association, by MR. R. H. LAWLOR, Waterloo, Ia.]

I have been asked by your Board to prepare a paper dealing with the high pressure transmission of gas, a subject upon which so much has been written and said that it is difficult to present anything, wholly original or with which you are not acquainted. A personal experience is the best I can offer, which I hope will better suit you than any theoretical discussion. The high pressure problem came up to us following an explosion in our purifying house at Cedar Falls, which resulted in the destruction of our plant there. It was then up to us to rebuild at that place or pump the product from our gas plant at Waterloo. Various reasons decided us upon the latter.

First, and most important, of these was the ability to concentrate the manufacture of gas for the two cities in the one plant at Waterloo, thereby reducing not only the cost of production but also the maintainance charge, which in small plants is always relatively high.

Then, again, we were able to install a booster system from the high pressure line to supplement the pressure in the West Side system of mains which, during peak hours, had become inadequate to the increased and increasing demand. Further than this we were in position to use residence regulators and secure quite a number of suburban and rural customers who were otherwise outside our territory.

Both Waterloo and Cedar Falls are situated on the Cedar river, the stream dividing the former into 2 parts in population at about the ratio of 3 to 5, the larger number being on the East Side which is also the location of our plant. Cedar Falls is about 8 miles distant and on the west bank of the Cedar. In determining the location of the pipe line we followed the street car line as closely as the public highways would permit, knowing, of course, that the residential growth of the 2 cities would be along that route.

At the Waterloo plant we installed a cross-compound, automatic Ingersoll-Rand compressor, with a capacity of 25,000 cubic feet per hour, running at 180 revolutions per minute. Just outside the com-

pressor room we set a baffle-plate drum with drip to condense and remove the moisture from the gas. The line is of 4-inch steel-line pipe, with extra heavy malleable fittings and with long expansion joints of the S. R. Dresser pattern every 500 feet.

In crossing the river we used extra heavy, steel-line pipe connected all through with the Dresser river joint. This river crossing was laid at the lowest stage of water when it was possible to excavate a trench with pick and shovel, with drain as far as possible toward the farther side of the river where a small drip was put in. About 200 feet from the river we installed another baffle-plate drum with drip for the further removal of condensation. The gas main was laid at a depth of about 3 feet, though for experiment about 2 miles was only covered to a depth of about 18 inches. With this shallow pipe we experienced no difficulty last winter, nor do we believe there can be any under ordinary conditions, if proper provision is made for condensation and its removal within the first mile.

The only trouble with the high pressure system so far experienced was the result of an oversight in that we neglected to trap the outlet of the baffle-plate drum at the plant, which allowed some of the condensation water to pass out into the line and freeze. When the warmer weather of spring set in the ice loosened in the 4-inch line and was driven ahead to the river crossing about 1,000 feet, where it clogged up on one of the bends. Opening the end of this fitting enabled us to blow out this accumulation of ice and it has since remained clear.

To rectify this construction and avoid future trouble of like kind we put in a trap beyond the baffle-plate drum that is raised 5 feet above the drum, then down again to the main. To supplement the pressure on the old West Side distribution system we ran a line of 8-inch cast pipe connecting with the various street lines which it crossed and connected this 8-inch line with the high pressure line, using a Chaplin-Fulton sensitive governor for passing the gas from the high to the low pressure systems. This governor is installed in an 8 by 10 brick pit with 2 manhole covers in the top. The governor is by-passed with a 2-inch pipe, so that if we have trouble with it at any time we can regulate pressure with a gate valve while governor is being repaired.

To relieve excessive pressure we put in a seal of 2-inch pipe on the low pressure side of the governor, using for the purpose an iron box filled with zero oil, with a 2-inch pipe running down into the oil 8 inches, so that as soon as we get over 6½-inch pressure on low side the seal will blow.

For the Cedar Falls distribution we still use the pressure of the 50,000-foot holder, regulated by a Connelly automatic governor, the holder being filled directly from the high pressure line, pumping over the supply twice a day and keeping off the hours of greatest demand. We are well pleased with the system employed and believe it is doing as we hoped in effecting a material decrease in cost of manufacture and maintenance.

[Prepared for the JOURNAL.]

Timbering Holes for Gas Pipes.

By "R."

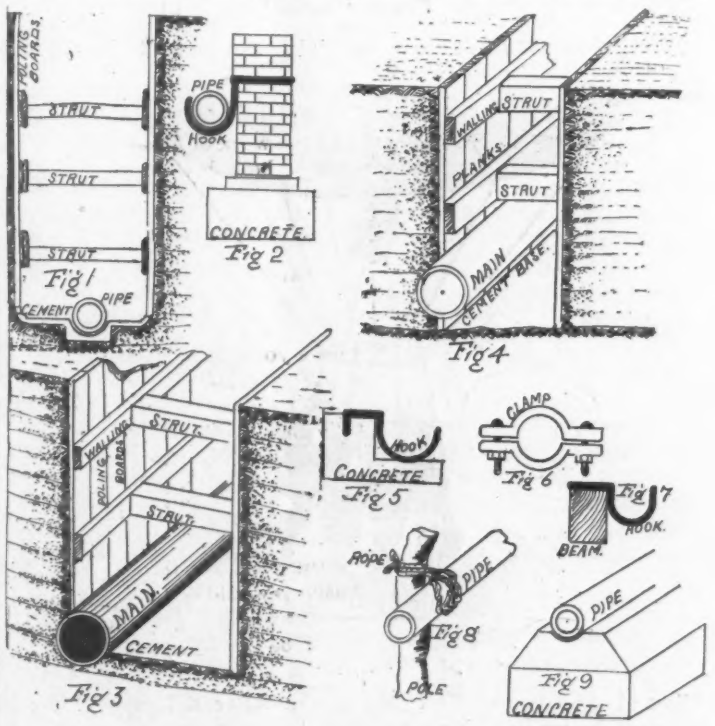
One section of the gas manufacturing business not very often touched upon is the proper timbering of holes, ditches and general excavations in which pipes are to be laid. The timbering to be used for this purpose, as an element of safety, ought to be fair material and exceedingly strong. Yet in looking into this matter the writer found a great amount of weak, decayed, knotty and defective timbers employed in bolstering up the side walls of dangerous excavations while gas mains were in progress of construction. While imperfect timber may answer the purpose in ordinary cases, care should be taken to employ only tested lumber in critical positions. There may be excavation of considerable depth in which there is a sandy or loose strata part way down. The clay-like strata is partly self-supporting and all goes well, even with defective timbering, until the depth beneath the clay strata is reached. Then, when the passage is made through the loose soil, there are great chances of this soil closing in on you, hence the need of perfectly constructed and powerful timbering supports. One has but little idea of the enormous pressure of the free earth on the timbers when the hole is of considerable depth. With fair ground you do not need timber very close; but fair ground is not always available. You have soft ground, sometimes slough ground to impregnate, all of which calls for careful boarding up.

Fig. 1 illustrates the formation of the supports for the hole in one case. The hole was cut down gradually to a depth of 12 feet and the timbering was done as the work progressed. The pipe was adjusted at the bottom and a thickness of cement used for a foundation. The employment of cement beds in which to place pipes is getting to be common, and the cement is used more and more liberally and generally in the business. Builders are employing cement to fill in about post holes instead of filling back with the original earth. The same principle is applied to the pipe, and cement acts as a protection for the pipe. Now, then, in timbering the sides of the hole the poleing boards are cut to the required length and arranged evenly along the walls. These poleing boards may be supported on end and driven down deeper as the hole is sunk, providing that the walling timbers and the struts are not too tight. The struts can be adjusted at an incline until the poleing boards and walling pieces are fixed in their permanent positions. When the struts are driven straight across they clinch the walling boards and the latter are expanded on to the poleing boards and a tight fit results.

When the hole is thus protected the work can be carried on in safety in connection with the pipes. In some cases the holes are filled in with the timbering left there, hence in case it is necessary to get at the pipe again the timbering is already there in readiness for excavation of the hole.

In some instances the supporting factor of the pipe line is made up by using a metal hook adjusted to the masonry of a brick post, as in Fig. 2. The brick post is supported on a cement foundation.

Fig. 3 shows another style of excavation with the pipe resting upon



the cement casing. In this instance a cement floor is constructed, and the employment of concrete foundations for this purpose is advocated by some. The application of the concrete is very similar to the putting in of a common concrete floor or walk. This results in a decidedly substantial support for one or more pipes, as shown in the drawing. The poleing boards are put in as usual, followed by the adjusting of the walling timbers. Then follow the struts, and these are correctly driven, thereby clinching the combination. Not very many nails or wooden pins are used in the building of these timbered holes, the reliance being placed upon the wedging and bracing of the contacting timbers for support. Still there are accidents occasionally; in fact, these must be expected. In one case, instead of using neatly fitting poleing boards of medium thickness, some heavy planks were employed, as in Fig. 4. All went well for a little while, but the planks began to spring, due to the exertion of the fiber of the wood influenced by the dampness. In a few weeks the planks were very much distorted. The crevices opened and loose earth dropped in.

For a time, the openings were plugged by driving in wedge-shaped pieces; but this proved to be non-effective. The entire system had to be removed and a timbering substituted constructed with common poleing boards. Then it is a good plan to have the struts correctly made. These should be nearly square and all cut the same length, otherwise the unequal pressure on the walling boards will be disastrous. You need a heavy mallet to drive the struts into place. I

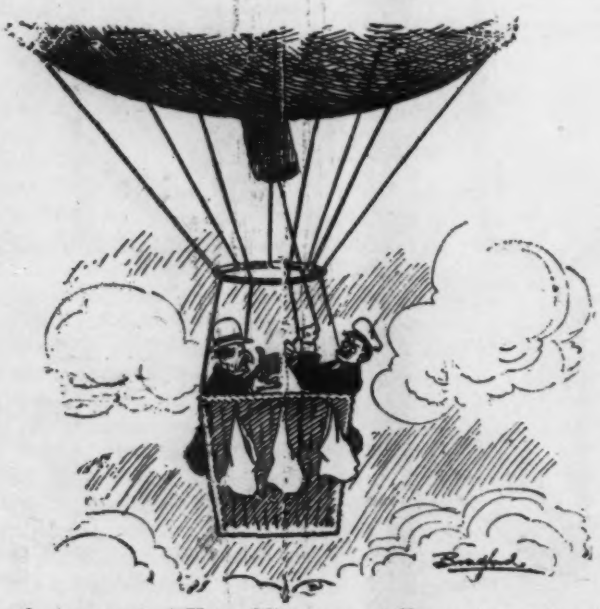
noticed that hammers of all hinds and sledges were used in driving struts, to the destruction of the same.

In the employment of concrete, in shaping brackets, stands, trimbrels, sockets and beds for gas pipes, the device shown in Fig. 5 is convenient. It consists of a concrete block furnished with the wrought iron hook in which the main can be placed. The typical clamp used in the securing of pipes for emergency reasons is shown in Fig. 6. It is wise to have a number of these clamps on hand. Of course there will be times when it is necessary to do makeshift work and secure your line of pipe to a stamp or projecting piece of some kind, as shown in Fig. 8. It is better, however, not to rely too much upon the rope for holding a gas main. It is better to drive a hood into a beam or to secure the hook to the top of a beam with bolts or lag screws, as illustrated in Fig. 7.

Referring again to the concrete beds which are being made for pipes underground, Fig. 9 shows one of a common form. If the bed is made the same size as the base of the trench or hole, then the material can be moulded direct; but in case the shape is to be smaller, boards will be used to shape the flask in which the cement form is moulded. Usually the concrete base is extended along the bottom of the ditch, and the earth is prevented from falling in during the work by utilizing the timbering plan exhibited in the foregoing diagrams. After the foundation is properly moulded the tapering edges can be finished off with the usual mason's tools.

From "Life."

First Aeronaut—"We are up too high. I'm going to let out some gas!"



Second Aeronaut—"Vot? Mit gas a tollar a tousandt! Fool! Trow out der sandt, vich costs nodink!"

[Concluded from Vol. LXXXVI., page 1070.]

New York's Public Utilities Law.

Section 69. *Approval of Issues of Stock, Bonds and other Forms of Indebtedness.*—A gas corporation or electrical corporation organized or existing, or hereafter incorporated, under or by virtue of the laws of the State of New York, may issue stocks, bonds, notes or other evidence of indebtedness payable at periods of more than 12 months after the date thereof, when necessary for the acquisition of property, the construction, completion, extension or improvement of its plant or distributing system, or for the improvement or maintenance of its service or for the discharge or lawful refunding of its obligations, provided and not otherwise that there shall have been secured from the proper commission an order authorizing such issue, and the amount thereof, and stating that, in the opinion of the commission, the use of the capital to be secured by the issure of such stock, bonds, notes or other evidences of indebtedness is reasonably required for the said purposes of the corporation. For the purpose of enabling it to determine whether or not it should issue such an order, the commission shall make such inquiry or investigation, hold such hearings and examine such witnesses, books, papers, documents or contracts as it may deem of importance in enabling it to reach a determination. Such gas corporation or electrical corporation may issue notes, for proper corporate purposes and not in violation of any provision of this or any other act, payable at periods of not more than 12 months without such consent; but no such notes shall, in the whole or in part, directly or indirectly be refunded by any issue of stock or bonds or by any evidence of indebtedness running for more than 12 months without the consent of the proper commission. Provided, however, that the commission shall have no power to authorize the capitalization of any franchise to be a corporation or to authorize the capitalization of any franchise or the right to own, operate or enjoy any franchise whatsoever in excess of the amount (exclusive of any tax or annual charge) actually paid to the State or to any political subdivision thereof as the consideration for the grant of such franchise or right. Nor shall the capital stock of a corporation formed by the merger or consolidation of two or more other corporations, exceed the sum of the capital stock of the corporations, so consolidated, at the par value thereof, or such sum and any additional sum actually paid in cash; nor shall any contract for consolidation or lease be capitalized in the stock of any corporation whatever; nor shall any corporation hereafter issue any bonds against or as a lien upon any contract for consolidation or merger.

Section 70. *Approval of Transfer of Franchise.*—No gas corporation or electrical corporation shall transfer or lease its franchise, works or system or any part of such franchise, works or system to any other person or corporation or contract for the operation of its works and system, without the written consent of the proper commission. The permission and approval of the commission, to the exercise of a franchise under Section 68 of this act, or to the assignment, transfer or lease of a franchise under this section shall not be construed to revive or validate any lapsed or invalid franchise or to enlarge or add to the powers and privileges contained in the grant of any franchise or to waive any forfeiture. No such corporation shall directly or indirectly acquire the stock or bonds of any other corporation incorporated for, or engaged in, the same or a similar business, or proposing to operate or operating under a franchise from the same or any other municipality, unless authorized so to do by the commission. Save where stock shall be transferred or held for the purpose of collateral security only with the consent of the commission empowered by this act to give such consent, no stock corporation of any description, domestic or foreign, other than a gas or electrical corporation, shall purchase or acquire, take or hold, more than 10 per centum of the total capital stock issued by any gas corporation or electrical corporation organized or existing under or by virtue of the laws of this State. Nothing herein contained shall be construed to prevent the holding of stock heretofore lawfully acquired. Every contract, assignment, transfer or agreement for transfer of any stock by or through any person or corporation to any corporation, in violation of any provision of this act, shall be void and of no effect, and no such transfer or assignment shall be made upon the books of any such gas corporation, or electrical corporation, or shall be recognized as effective for any purpose.

Section 71. *Complaints as to Quality and Price of Gas and Electricity; Investigation by Commission; Forms of Complaints.*—Upon the complaint in writing of the Mayor of a city, the Trustees of a village or the town board of a town in which a person or corporation is authorized to manufacture, sell or supply gas or electricity for heat, light or power, or upon the complaint in writing of not less than 100 customers or purchasers of such gas or electricity in cities of the first or second class, or not less than 50 in cities of the third class, or of not less than 25 elsewhere, either as to the illuminating power, purity, pressure or price of gas or the initial efficiency of the electric incandescent lamp supply, or the regulation of the voltage of the supply system used for incandescent lighting, or price of electricity sold and delivered in such municipality, the proper commission shall investigate as to the cause for such complaint. When such complaint is made, the commission may, by its agents, examiners and inspectors, inspect the works, system, plant and methods used by such person or corporation in the manufacturing, transmitting and supplying of such gas or electricity, and may examine or cause to be examined the books and papers of such person or corporation pertaining to the manufacture, sale and transmitting and supplying of such gas or electricity. The form and contents of complaints made as provided in this section shall be prescribed by the commission. Such complaints shall be signed by the officers or by the customers, purchasers or subscribers making them, who must add to their signatures their place of residence, by street and number, if any.

Section 72. *Notice and Hearing; Order Fixing Price of Gas or Electricity, or Requiring Improvement.*—Before proceeding under a complaint presented as provided in Section 71, the commission shall cause

notice of such complaint, and the purpose thereof, to be served upon the person or corporation affected thereby. Such person or corporation shall have an opportunity to be heard in respect to the matter complained of at a time and place to be specified in such notice. If an investigation be instituted upon motion of the commission the person or corporation affected by the investigation may be permitted to appear before the commission at a time and place specified in the notice and answer all charges which may be preferred by the commission. After a hearing and after such investigation as may have been made by the commission or its officers, agents, examiners or inspectors, the commission within lawful limits may, by order, fix the maximum price of gas or electricity to be charged by such corporation or person, or may order such improvement in the manufacture or supply of such gas, in the manufacture, transmission or supply of such electricity, or in the methods employed by such person or corporation, as will in its judgment improve the service. The price so fixed by the commission shall be the maximum price to be charged by such person or corporation for gas or electricity in such municipality until the commission shall upon complaint as provided in this section or upon investigation conducted by it on its own motion, again fix the maximum price of such gas or electricity. In determining the price to be charged for gas or electricity the commission may consider all facts which in its judgment have any bearing upon a proper determination of the question, although not set forth in the complaint and not within the allegations contained therein.

Section 73. *Forfeiture for Non compliance with Order.*—Every gas corporation and electrical corporation and the officers, agents or employees thereof shall obey, observe and comply with every order made by the commission under authority of this act, so long as the same shall be and remain in force. Any such corporation, or any officer, agent or employee thereof, who knowingly fails or neglects to obey or comply with such order, or any provision of this act, shall forfeit to the State of New York not to exceed the sum of $1,000 for each offense. Every distinct violation of any such order or of this act, shall be a separate offense, and in case of a continuing violation each day shall be deemed a separate offense. An action to recover such forfeiture may be brought in any court of competent jurisdiction in this State in the name of the people of the State of New York, and shall be commenced and prosecuted to final judgment by counsel to the commission. In any such action all penalties and forfeitures incurred up to the time of commencement, the same may be sued for and recovered therein and the commencement of an action to recover a penalty or forfeiture shall not be, or be held to be, a waiver of the right to recover any other penalty or forfeiture; if the defendant in such action shall prove that during any portion of the time for which it is sought to recover penalties or forfeitures for a violation of an order of the commission the defendant was actually and in good faith prosecuting the suit, action or proceeding in the court to set aside such order, the court shall remit the penalty or forfeiture incurred during the pendency of such suit, action or proceeding. All moneys recovered in any such action, together with the costs thereof, shall be paid into the State treasury to the credit of the general fund.

Section 74. *Summary Proceedings.*—Whenever either commission shall be of opinion that a gas corporation electrical corporation or municipality within its jurisdiction is failing or omitting or about to fail or omit to do any thing required of it by law or by order of the commission or is doing anything or about to do anything or permitting anything or about to permit anything to be done, contrary to or in violation of law or of any order of the commission, it shall direct counsel to the commission to commence an action or proceeding in the Supreme Court of the State of New York in the name of the commission for the purpose of having such violations or threatened violations stopped and prevented either by mandamus or injunction. Counsel to the commission shall thereupon begin such action or proceeding by petition to the Supreme Court alleging the violation complained of and praying for appropriate relief by way of mandamus or injunction. It shall thereupon be the duty of the court to specify the time not exceeding 20 days after service of a copy of the petition within which the gas corporation, electrical corporation or municipality complained of must answer the petition. In case of default in answer or after answer, the court shall immediately inquire into the facts and circumstances in such manner as the court shall direct without other or former pleadings, and without respect to any technical requirement. Such other persons or corporations, as it shall seem to the court necessary or proper to join as parties in order to make its order, judgment or writs effective, may be joined as parties upon application of counsel to the commission. The final judgment in any such action or proceeding shall either dismiss the action or proceeding or direct that a writ of mandamus or an injunction or both issue as prayed for in the petition or in such modified or other form as the court may determine will afford appropriate relief.

Section 75. *Defense in Case of Excessive Charges for Gas or Electricity.*—If it be alleged and established in an action brought in any court for the collection of any charge for gas or electricity, that a price has been demanded in excess of that fixed by the commission or by statute in the municipality wherein the action arose, no recovery shall be had therein, but the fact that such excessive charges have been made shall be a complete defense to such action.

Section 76. *Jurisdiction.*—Whenever any corporation supplies gas or electricity to consumers in both districts, any application or report to a commission required by this act shall be made to the commission of the district within which it is mainly supplying, or proposing to supply, such service to consumers. But nothing herein contained shall be construed to deprive the commission of either district of the power of supervision and regulation within its district. And either commission shall have power to enter and inspect the plant of such corporation, wherever situated.

Section 77. *Powers of Local Officers.*—If in any city of the first or second class there now exists or shall hereafter be created a board, body or officer having jurisdiction of matters pertaining to gas or electric service, such board, body or officer shall have and may exercise such powers, jurisdiction and authority in enforcing the laws of State and the orders, rules and regulations of the commission as may be prescribed by statute or by the commission.

Testing Gas: Past, Present and Future.[1]

By H. Leicester Greville, F.I.C.

In the history of gas—especially with regard to the development of illuminating power—we have an illustration in practice of the old Arabian Nights story of "Aladdin's Lamp," with some modifications. We have at least the exchange of the old lamp for the new; the transition from the old flat-flame burner, giving an illuminating power of, at the extreme, some two candles per cubic foot, to the modern incandescent, giving (at a moderate estimate) 25 candles per cubic foot. The name of "Welsbach" may thus be substituted for that of "Aladdin."

Turning from this slight digression to a brief record more essentially dealing with the heading of the present article (which embraces a long experience of the whole subject), it is difficult to sufficiently condense my remarks, without possibly trying the patience of my readers, or trespassing too much on your space. At the same time I hope that the question of the testing of gas is of so much importance to all connected with the gas interests—to the consumer as much as to the manufacturer—that some digression may be justified.

There are two questions over the determination of illuminating power—viz., the standard used for comparison, and the conditions under which the gas should be consumed. From the first records of official gas testing, I believe that the sperm candle was the standard, and that the gas was consumed at the rate of 5 cubic feet per hour, with variable burners and chimneys. The primeval iron argand and chimney may be abrogated to a long forgotten past; and we can make a fair start on the consideration of the general subject with the advent of Sugg's "London" argand with a 6-inch by 2-inch chimney for common gas, and a No. 7 batswing for cannel gas, as standard burners. I am speaking of both gases, because my first experience of gas testing was at Arundell street, Haymarket, W.—the first, I believe, official testing station. Mr. T. W. Keates was the Official Gas Examiner, and he eventually became Superintending Gas Examiner to the Metropolitan Board of Works. When official testing extended, I acted under him for a period of ten years, during which many testing stations came into existence—all under the same conditions. The sperm candle was the standard of light, and the consumption of gas was at a rigid 5 cubic feet per hour in the Sugg "London" argand with a 6-inch by 2-inch chimney.

But a time came in which the (so-called) standard sperm candle fell into contempt. It passed through various vicissitudes. It was nursed carefully by its advocates and was cursed soundly by its opponents. For some strange reason, everyone seemed to wish to protract its existence. The Gas Referees gave limitations as to the consumption under which certain tests were to be accepted or rejected so as to be registered as official. Instructions were issued as to times of lighting

1. *Journal of Gas Lighting.*

before a test, adjustment of the two candles, as to the curvature of the wick towards the photometer disk, etc.

Then came in another question: What was the standard candle? Officialism, represented by the County Council (at this stage of the history), introduced a new brand of so-called standard candles which—although a legitimate standard candle—gave most disadvantageous results against the gas. I am not quite sure as to my memory over the subject and, unfortunately, have not any records to refer to, but, as far as I can remember, the candle for many years in use was of the well-known brand the "Miller," and the fresh introduced was the "Barclay."

Many tests were made, and there were many conflicts between gas companies on the one hand and officialism (presumably representing public interests) on the other. Eventually there was the "Standards of Light Commission" inaugurated, in which I represented the interests of the Commercial Gas Company. I never wish to go through a more painful experience again. All sorts of brands of candles were tested against a reliable standard – viz., the Methven screen, with pure and with carburetted gas. Further tests were made with the 1-candle Harcourt pentane standard. The difficulty I had over this is indescribable. Valuable in itself, it was most trying to adjust under conditions of the adjacency of the testing room to a street where heavy traffic was constantly passing. Constant vibrations made the adjustment of a correct height of flame almost impossible.

Of the many standards proposed as a substitute for the candle, the possibilities were at that time: (1) The Harcourt 1-candle pentane; (2) the Methven 2-candle—plain coal gas or carburetted gas; (3) the Dibdin 10-candle—air carburetted with pentane, with cut-off screen; and (4) the Sugg burner, with the screen cut off to 10 candles, with ordinary gas

With regard to No. 1, I have always considered that a 1-candle standard is undesirable. I am aware that a 2-candle pentane standard has been used; but there is great liability of error not only with regard to the standard air gas but on the adjustment of the height of flame and its susceptibility to vibrations. With regard to the Methven standard. It was no doubt at the time reliable, more especially when used with pure coal gas, carburetted by pentane. No. 4 was good at its time with pure coal gas. No. 3 was undoubtedly the best, as independent of the composition of the gas, as the light was derived from simply carburetted air.

Many tests were made over the proposed standards; but the main dispute was simply this: What was the equivalent of a standard candle in any suggested new unit? The Dibdin 10-candle standard was near acceptance on a modification of the height of the cut-off screen which should represent the average candle; and after a long series of tests it was agreed that the screen should be somewhat lowered. Then came the 10-candle pentane Harcourt standard—still accepted, and upon which it is difficult to suggest any improvement. Criticisms have been made over variations of atmospheric conditions, temperature, pressure, humidity, etc.; but nothing has shown that the validity of this standard is vitiated to any material extent, under fairly normal conditions and with reasonable precautions in its use.

Apart from its accuracy, the Harcourt 10-candle pentane standard has the great advantage of extreme simplicity. It is a "*multum in parvo;*" it is complete in itself. A requisite supply of pentane and a suitable adjustment of the height of the flame, and there is an efficient and reliable standard.

With the introduction of the new standard came the advent of the table photometer, with the abrogation of the rigid 5 cubic feet gas consumption in favor of burning up to a constant 16-candle flame. With regard to the use of the table photometer in place of a well-constructed form of open-bar photometer, there are many *pros* and *cons;* but with regard to the change of procedure, of abolishing the rigid 5 cubic feet consumption, and burning the gas at such a rate as to afford a light of 16 candles, there could be no difference of opinion from unbiased minds—viz., that it was fairer to the proper development of the light of the gas. It was really a limited recognition of the necessity for adjusting the air supply to the quality of the gas. This change was of advantage to the gas companies, but it was coupled with one other change which was in a sense disadvantageous. Under the old *régime*, when gas was used mainly for lighting purposes, the rule was for official tests to be made during periods of maximum consumption, and Sunday was considered officially a *dies non*. With the new *régime*, the gas could be tested at any time in the day. The gas examiner could make his tests at his own convenience; and the regulation is still in existence. *Primâ facie*, there is no injustice. But not all testing stations are on a leading main, and there is common experience over the deterioration of illuminating power from limited circulation and excessive friction. Therefore, the best test conditions are those of the maximum supply, as the gas company cannot do more than send out gas from their works conforming to legislative requirements.

General gas testing at the present time is peculiar. Many changes have been made of late years, and modern methods must be regarded as more or less tentative. Sulphur restrictions have been abolished. Tests for ammonia are not made. Illuminating power is ascertained by a burner with an adjustable air supply available for all grades of gas. As far as I can judge, there would be an advantage on all sides of the question. High class gas does not really suffer, while low grade gas has every advantage. There can possibly be no better method of testing various grades of illuminating gas than by a regulated air supply – always assuming that an Argand with a chimney is regarded as a test burner. At the same time, it is a crude method of determining the actual value of a gas for lighting purposes. In some places on the Continent, no consumer dreams of using anything but an incandescent burner. Any individual who talked about an Argand or a fishtail, batswing, or union-jet, would be regarded as a fool who had not accepted the increased knowledge which should accrue with increasing years.

When I spoke of the present system of gas testing as "tentative," my expression meant to convey that there was an element of uncertainty which time and experience could alone determine as to what constitutes the best gas for the use of the public, consistently with the gas company making their fair profits. There is now no penalty except for deficiency of illuminating power or pressure. At the same time tests are being made over sulphur compounds, and the value of the gas as to its illuminating efficiency in flat flame burners. The latter points are very interesting; but are they necessary? It is such a matter of common knowledge that any flat flame burner is inferior in the development of illuminating power to an argand, and the latter again far more than an incandescent, that it almost looks like "thrashing a dead horse."

With regard to calorific value, the question is different. The time must come at which the valuation of gas must depend on its calorific value—mainly net, and not gross; the distinction being that the former is the only criterion as to the value of gas for ordinary purposes apart from a bath heater.

With regard to sulphur, the only rational excuse for the abrogation of the proportion of sulphur compounds must have been the introduction of the incandescent burner. Consumers who use a flat flame or an Argand burner would suffer the penalty of polluting the atmosphere of their living rooms with the amount of increased sulphur in the gas. Those on the other hand who use the incandescent would not have any increased vitiation or pollution owing to the decreased gas consumption. A simple calculation will show this—

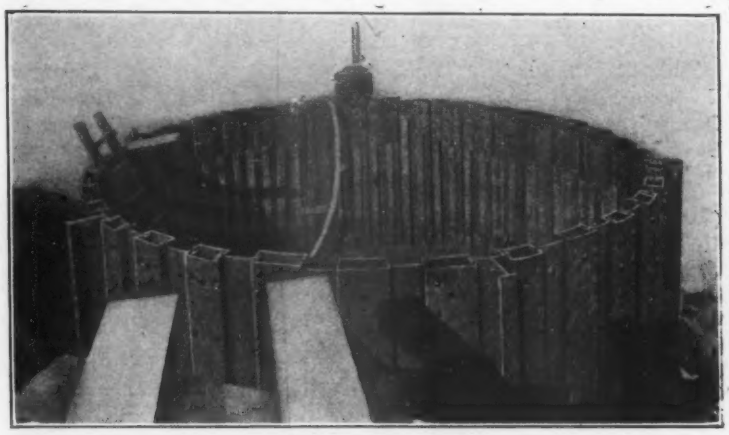
Flat flame burner with a consumption of 8 cubic feet per hour, and sulphur at 20 grains per 100 cubic feet. Illuminating power, 14 candles. Sulphur per hour, 1.6 grains.

Incandescent burner at 2 cubic feet per hour, and sulphur at (say) 50 grains per 100 cubic feet. Illuminating power, 50 candles. Sulphur per hour, 1 grain.

In regard to the future of gas testing, I do not profess to be a prophet. I cannot, however, but regard the records of the illuminating power of flat flame burners, the proportion of sulphur in the gas, etc., as of academic interest simply. A time will come at which it will be recognized that the calorific value of gas is the truest measure of its real value. The gas of the highest calorific value gives the consumer the best value for his money, if he can be made to understand the true aspect of the question. It affords him the best light he can get with an incandescent burner, and the best value he can get for cooking purposes. It also gives the best value to the commercial aspect of the question—viz., the consumer who uses gas for purposes of motive power.

The Jackson Sheet Piling.

The illustration affords an example of a new method of lining vertical shafts, while in process of sinking in loose earth. The cylindrical caisson shown is built of the Jackson patent interlocking steel sheet piling, and was used in the construction of the section of shore the southwest land and lake tunnel at Seventy-third and Bond streets, Chicago, to be built for supplying water to the suburban towns of Pullman, West Pullman and Blue Island. This section of the tunnel, comprising 7,800 feet of its total length of 2 miles, will extend about 1¼ miles eastward under the lake, and is being built by Geo. W. Jackson, Incorporated. The cylinder is composed of 12-inch I-beams and 12-inch channels, the latter held together in pairs by bolts and separators in such a manner that the I-beams can be interlocked with them



and any member moved vertically without disturbing the continuity of the circle.

This and other forms of steel sheet piling have been employed in recent years in caisson work. The point of chief interest in this case lies in the method used to sink it in position. Obviously it would be extremely difficult to construct an even approximately true cylinder by driving each member separately into the earth, as is done in rectangular work. Instead, a huge steel barrel 21 feet in diameter and 50 feet high was assembled aboveground and driven down to rock or hard pan.

It will be noticed that at regular intervals the outer circumference is buttressed by beams projecting outward from the body. These are securely riveted to the casing beams, and, besides increasing the strength, serve to hold the structure in line while being driven. Powerful blows from a 5,000 pound steam hammer were applied successively to the ends of the adjacent sections, following round the circle until the entire structure was gradually driven into the ground as a unit.

The soil through which it passed being of sand and gravel, interspersed with loose boulders, made the work especially difficult. To sink some sections a single foot required as many as 100 blows of the hammer, yet the work was completed in 5 days.

The sheeting forms a water tight compartment, and when the earth inside of it is excavated it will constitute a permanent lining for the shaft down to foundation rock. The shaft will be extended on down to the tunnel level through solid rock 135 feet below the surface. When the tunnel work is finished a coating of cement will be applied to the surface of the casing to protect the steel. Another similar caisson will be sunk in the lake to the tunnel level at a point 1½ miles out, and work on the 14-foot tunnel bore will be carried on simultaneously from each shaft.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, June 10th, 1907.

A Modern Gas Works.—More About Coalite.—Dearer Coal.

The Southern District Association of Gas Engineers and Managers had a most successful and enjoyable summer meeting at Bournemouth last week. There were special attractions from a technical point of view, in the shape of a battery of vertical retorts to be seen in operation, and the new gas works recently constructed at Poole, in addition to the natural inclination to visit a popular seaside resort at this season of the year. Mr. H. W. Woodall, the President of the Association, is the engineer and manager of the Bournemouth Gas and Water Company, and it was well known that in setting out his new works he had not been satisfied to follow old established lines, but had made a bold endeavor to utilize every available modern idea and improvement. This may account for the fact that the muster fairly beat the record, a very respectabe proportion of the total number of members putting in an appearance. Mr. Woodall had spared no pains in providing for the comfort of his visitors and was ably supported by the chairman and directors of his company, who joined the party and fraternized freely with the members. The excellent character of the technical proceedings was thus greatly enhanced, and every visitor who accepted the cordial invitation to attend was was not only impressed with the engineering novelties that he had been able to inspect, but carried away with him the pleasant recollection of having been received and entertained as a welcome and honored guest.

The vertical retort installation comprised 2 settings of 4 retorts in each. The retorts are 25 feet long, oval section, tapering from 30 by 22 inches at the bottom to 24 by 10 inches at the top, and each carbonizing 2 tons of coal per day. Both the charging and discharging are continuous, the retort being kept full of coal, and fed from a hopper at the top, while the coke passes into a water trough below the bottom of the retort, and is carried out and delivered into barrows or other desired receptacle. The steam generated by the cooling of the coke passes up into the retort and is utilized to make water gas, so that the operations are conducted in practically closed vessels and there is no escape of gas, smoke or steam. With the exception of the space occupied on one side by the coke conveyor and receptacles for the coke, the settings require no more ground space than that covered by the foundations, so with the Woodall and Duckham retort the ordinary retort house with its lofty center, ventilator, and 75 or 80 feet span roof becomes a thing of the past. The vertical setting could be erected in the open like a cupola or a coke oven. The average results over 22 ordinary working days were stated to be a good 13,000 cubic feet of gas per ton of coal carbonized, candle power 14.2 and calorific value 546 B. T. U. There is a large yield of tar and of ammonia, and the coke is of a superior quality, approaching the hardness and den sity of foundry coke. The process is about to be installed elsewhere, and the above named results seem to show that an important improvement in carbonizing has emerged from the preliminary stage, and is well on the way towards practical success.

It should be explained that the primary object of the new works at Poole is to secure the benefit of water carriage. The original site at Bourne valley has proved too small for the rapidly increasing business - the output of gas has doubled within the last 7 years—and is not conveniently situated either for the delivery of coal or for the removal of residuals, and so a new site was secured having a frontage to the harbor. Coal can be brought in lighters directly under the unloading machinery, and coke or tar can also be shipped without any cost for cartage. The new works present a somewhat one-sided appearance by reason of the absence of purifiers or gasholders. The purifiers are situated on another block at some little distance, and the gasholders at Bourne valley will be utilized, as being well in the center of the district, and therefore well situated as regards distribution; so that one would scarcely know them to be intended for the manufacture of gas in the absence of the usual features. The buildings are all steel frame structures, well designed, but with a marked absence of superfluous ornament, and the principal blocks are the coal retort house, the carburetted water gas house, and the power house. With regard to the last named, the complete mechanical transport of material is the leading feature of the whole plant. Coal is carried direct from the lighter to the store, or to the breaking machine and put into the retort without being touched by a shovel. The coke is dealt with in a similar way. And the large amount of power required is provided by means of electricity, generated by gas engines. The dynamo room is of such an extent that the uniniitated might be excused for asking whether he was at a gas works or at an electricity works. The visitors were able to see coal being raised from a lighter by means of a grab that took hold of a respectable cartload at one bite, and either conveyed it to the coal breaker, or dropped it at any part of the store yard. From the breaker it is received by conveying machinery and carried to overhead hoppers. There are 10 beds of 10 double retorts in each, worked by DeBrouwer-Jenkins machinery. The coke is pushed out at the far side by means of a ram, and received by conveying machinery, which delivers it into large receivers at one end of the house, and the retorts are charged by a DeBrouwer charging machine. It will be seen that the machinery operates from one side of the house only, all that is done on the other being the reception and removal of the coke. The coke receptacles are taken by an overhead travelling crane arrangement and emptied at any part of the stack, or into a breaking and sorting apparatus from which the various sizes are collected in overhead storage hoppers, and from these it is possible to load directly into carts or other vehicles. The water gas section is laid out for the reception of four ¾ million sets of Humphreys & Glasgow plant, two of which are at present erected and in use. Adjoining is the boiler house and sulphate house, this being the only portion of the works where steam is required.

Some practical information respecting the new material "coalite" has been published, which goes to show that the remarks made about it in my April letter are fairly correct. Slack coal is subjected to carbonization at a dull, low, red heat, or about 800° F. The retorts used

are described as vertical boxes or stills 12 feet high, 4 feet 10 inches in horizontal section. The weight of a charge is about a ton, and the period of exposure 8 hours. The resulting product is not cooled by water. The process is, therefore, very much in the neighborhood of the large retorts or ovens that were used in the early days of gas lighting. One ton of slack is said to produce 14 cwt. of coalite, 5,000 to 6,000 cubic feet of 20-candle gas, calorific value 850 B.T.U., 22 gallons of tar and 16 pounds sulphate of ammonia. The coalite contains 80 per cent. of carbon and 12 per cent. of volatile matter. The high calorific value of the gas is due to the presence of a large proportion, over 60 per cent., of methane. It is remarkable that the coalite, though returning 12 per cent. of volatile matter, does not exceed in proportion the coke obtained by carbonizing at 2 or 2½ times the temperature, or in other words, that there should be approximately the same weight of volatile matter – about 6 cwt. to the ton – given off at the low temperature of 800°, as is usually obtained at the gas works with a temperature of 2,000°. It would appear that the larger bulk of gas and lesser yield of tar obtained in the last named case are simply the results of secondary action. Gas engineers would also like to know how much blue water gas or other diluent could be added to the 20-candle gas to bring it down to 15 or 16-candle power.

About 35 years ago a process was brought out by Dr. Eveleigh under the title of "patent gas," and was worked on a practical scale at Barnet. The idea of the inventor was to carbonize coal in the first place at a low red heat in iron retorts, and to treat the large yield of oil or tar by a secondary process, the ultimate result being a larger yield of high quality gas than was obtainable by the ordinary processes then in vogue, and a valuable residue of pitch. As the result of practical experiments a somewhat higher temperature than that above named was decided upon—viz., 1,200° to 1,400°—and the retorts were oval, 9 feet long by 24 by 16 inches section. The charge was heavy, 4 to 4½ cwt., and it was allowed to remain 8 to 12 hours in the retort. A paper describing the process was read before the British Association of Gas Managers in 1872, and a report from two eminent experts appeared in the *Journal of Gas Lighting* about that time. The engineers concerned in the working do not appear to have been impressed with anything particular about the quality of the coke, which was disposed of in the ordinary way. Many practical difficulties were encountered in the working of the process, and although it attracted great interest at the time, and was inspected by the principal gas engineers, it was not adopted elsewhere, and after the agreement with the Patent Gas Company had expired the Barnet Company returned to ordinary methods of manufacture.

It will be evident that the production of coalite at an ordinary gas works would only involve replacement of the retorts. Until we know whether the public are sufficiently appreciative of the numerous advantages claimed, as compared with coal or coke, to pay a price that will admit of remunerative working, it would be idle to speculate on the commercial and other prospects following on a substitution of a temperature of 800° F. for the 2,000° to 2,200° now generally favored in gas works.

As indicated in the early part of this year, gas manufacturers will have to face the question of dearer coal. Those who are dependent upon sea borne coal will have to pay 2s. 6d. to 3s. 6d. more per ton, while collieries at a distance from the sea are contented to accept a little less. To some extent the stiffened market is due to foreign contracts, which enable the collieries within easy reach of a good water front to stand out for higher prices, thus driving the home demand inland and leading to an all round levelling up. But it is impossible for anyone who has had experience in going through lists of tenders for the supply of coal to avoid the conclusion that the position is also assisted by something of the nature of an agreement or combine behind the scenes. If gas manufacturers are content to accept this sort of thing without resistance, another advance next year may be looked for as a natural consequence, and they will, therefore, do well to consider some of the competitive schemes at present before them, by which gas can be produced from other materials. The coal boom of 1900 was a powerful stimulant to water gas processes; as a consequence the cupola form of generator has become a familiar object to all gas engineers. In addition to this there is the methane-hydrogen process in practical use at Swindon and Truro, the Delwik and many others, which look as staple material in directions away from the coal mine. Fortunately gas engineers are not in the helpless position that they occupied in 1873. They do not want to disturb the present comfortable relations with their customers by raising the price of gas and will be prepared to regard such a step as a last recourse, only to be acted upon after everything else has failed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE village trustees of Buchanan, Mich., have virtually arranged the terms between the village and the owners of the Niles (Mich.) Gas Company, under which the latter will continue its pipe system to Buchanan.

MR. A. S. HALL, who has been appointed Manager of the Columbia (S. C.) Gas Light Company, says that with his new equipment he will double the Company's present output rate before 1910 is reached.

ALD. KAY, of the Atlanta (Ga.) City Council, is very anxious that the city should inaugurate a system for the inspection of gas meters.

THE syndicate which succeeded to the control of the Hillsdale (Mich.) plant is the one that now operates the plants at Coldwater and Monroe, Mich.

AT the annual meeting of the Exeter (N. H.) Gas Light Company the officers chosen were: Directors, Edward Hatch, Odiorne Swayne, A. P. Browne, Gorham Rogers and Wm. Burlinghame; Treasurer, A. F. Cooper.

THE offices of the Cairo City (Ills.) Gas Company have been removed to the Jennelle Block, at the northeast corner of Eighth street and Washington avenue.

THE authorities of Crotty, Ills., have authorized the Northern Illinois Gas and Electric Company to distribute artificial gas through the named place. Under the agreement the Company may charge not to exceed $1.50 per 1,000 cubic feet, gross, or $1.25 net; the candle value is to be not less than 16; the supply is to be laid on within a year; the maximum pressure may not exceed 3 inches, and the grant is to last for 30 years.

MR. ALEX. WYNESS, JR., has resigned the position of Manager to the Northwestern Michigan Light and Power Company, of Manistee, Mich., to accept the management of the Vincennes (Ind.) Light and Power Company. Mr. Wyness is a practical and competent gas engineer and is a member of the American Gas Institute. His many friends in the western division of New York State (he was for quite a period Secretary and Superintendent of the Geneseo Gas Light Company) will be pleased to hear of his promotion.

THE Arlington (Mass.) Gas Light Company has applied to the Massachusetts Board of Gas and Electric Light Commissioners for the right to increase its bonded indebtedness in the sum of $100,000.

JUDGE STEVENS, in Court at Salem, Mass., recently sentenced one Alexander Pelley to 2 years in the House of Correction for stealing from the money boxes of prepayment meters.

MR. E. C. WHITE, recently in the service of the San Antonio (Tex.) Gas and Electric Company, as Superintendent of its gas division, has been appointed Eastern Sales Agent for the Western Gas Construction Company.

TO-DAY an odd voting contest will be decided in Bangor, Me. A ballot will then be concluded which had for its object the naming of the most popular religious order or secret society in Bangor and the adjoining town of Brewer. The one getting the greatest number of votes will be awarded a $35 range; the second, a $25 range; the third, a $15 range.

THE annual meeting of the Louisville (Ky.) Gas Company will be held to-day. It pleases us much to add that the reports for the twelvemonth will show an increase in its trading that is sufficiently great to even astonish the imperturbable Mr. Barret.

THERE seems to be nothing more than talk in the statement that Mr. J. B. McGowan is to resign from the Presidency of the Kansas City, Missouri, Gas Company.

MR. CYRUS S. EATON, of Cleveland, O., seems the active factor in the project for the construction of a gas plant in Portage la Prairie, Wis.

THE Concord (N. H.) Gas Light Company is arranging for the construction of a gasholder up to retaining 150,000 cubic feet.

THE output from the gas division of the public works department of Duluth, Minn., is showing tremendous gains. For instance, the out-

put for May, 1907, showed a gain of 28.4 per cent. over that for May, 1906.

MR. MARTIN E. JENSEN, who was elected last month to succeed Judge John E. Thayer as a member of the Norwich City (Conn.) Board of Gas and Electric Commissioners, has declined the appointment.

A GAS works for Lisbon Falls, Me., is under consideration. The Company (it is to be known as the Lisbon Falls Gas and Electric Company) is capitalized in $500,00, and among its promoters are Messrs. H. E. Plummer and Chas. Dickinson, of Lisbon Falls, and Mr. W. H. Newell, of Lewiston.

AT the annual meeting of the Claremont (N. H.) Gas Light Company the officers elected were: Chairman, Seth M. Richards; Clerk, H. H. Webb; Treasurer, George A. Tenney. This concern is controlled by the Monadnock Mills Corporation.

THE concession of 25 cents per 1,000 cubic feet in the gas rate at Fitchburg, Mass., goes into effect to-day. The rate is $1.25 per 1,000.

MR. R. I. SPEER has been appointed Auditor of the Western Gas Construction Company, vice Mr. Schwann, who resigned to accept a responsible position with the Damascus Brake Beam Company, of Cleveland, O.

WHAT do you think of this? About a fortnight ago a dinner was given to Mr. Archibald S. White, President of the Columbia Company, in the handsome dining room of the Hamilton Club, Hamilton, O. Naturally the guest of the evening was called upon to make "a few remarks." He properly responded, and among other things he announced the Columbia Company (it had just been awarded a franchise for supplying natural gas in Hamilton) would furnish gas for lighting the streets of Hamilton free for a period of 20 years.

MR. WM. WAGNER has been in the employment of the St. Paul (Minn.) Gas Light Company since June, 1857, starting in as a gasfitter. He is on the pay rolls, although he is not expected to do much work—just as much or as little as he likes. On his 50th year of service Manager Doty called him into the office and presented him with 50 gold dollars. Mr. Wagner is in his 78th year, is a native of France, and came with his parents to this country in 1829.

MR. C. K. HOLLIDAY has tendered his resignation as President of the Excelsior Coke and Gas Company, of Topeka, Kas., as per the following letter to Mr. A. N. Brady, under date of the 17th ult.: "Dear Mr. Brady—Several years ago you requested that I should accept the position of President of the Excelsior Coke and Gas Company, of this city. The salary was nil, the labor nothing. Out of courtesy to you, who had previously purchased the plant from my father, I accepted. The Excelsior Coke and Gas Company having passed out of existence some two years ago by reason of its absorption by the Consumers Light, Heat and Power Company, a Company with which I have never been affiliated, and the names of the officers of which I do not even know, I see no reason for my still holding the nominal position of President of the Excelsior Coke and Gas Company, a defunct corporation, if, indeed, I do still hold that title, which is a matter of considerable doubt. To settle all question of doubt in the premises, however, I am going to ask you, and I do hereby ask you, to kindly accept my resignation. It is quite an honor to be President of a gas company, but it also has its disadvantages. For instance, in a recent political campaign in this city, it was seriously charged in the public prints that I had 'done' the city by getting 25 cent gas for the people, and that I was President of the Gas Company that had brought about this awful hardship. As I am not and never was the President of the Consumers Light, Heat and Power Company, and as the Kansas Natural Gas Company virtually fixes all the rates for gas for all the cities on its pipe line, you see it is neither fair to me nor to you that I should continue to hold the nominal position of President of the old Excelsior Coke and Gas Company. You can readily see that while it is an honor it is also somewhat embarrassing. Assuring you that I appreciate more than I can tell the great benefits you have conferred upon Topeka by giving us the splendid natural gas system you have established here, which to my mind is the greatest boon this city has ever received or ever will receive, and sincerely trusting that you some time may receive an adequate return on the very large amount of money you have invested here, I have the honor to subscribe myself, your very sincere friend, C. K. HOLLIDAY."

WE understand that the owners of the Consumers Natural Gas Company, of Princeton, Ind., have awarded a contract for the construction of an artificial gas plant in that place to the Practical Gas Construction Company, of Chicago. It is said that the contract involves the expenditure of $60,000.

THE employees of the Haverhill (Mass.) Gas Company have organized an association for furthering their business ends and for their better mutual acquaintance. The officers of the association are: President, H. E. Cate; Vice-President, James E. Sullivan; Secretary, P. J. Anderson.

THE Greenville (Ills.) Gas Company has been sold to to Mr. Theodore Fisher, owner of the Greenville electric lighting plant. He will operate both hereafter. It is further stated that the purchase price was equal to par of the shares.

ON the 12th prox. a meeting of the shareholders in the York (Pa.) Gas Company will be held for the purpose of determining whether or not the capital stock shall be increased from $600,000 to $1,000,000.

MR. C. H. STONE, Chief Inspector of the staff of the New York State Commission of Gas and Electricity, will lecture before the Society of Illuminating Engineers, at its annual convention, to be held in Boston, the 30th and 31st insts. His subject will be "Standards of Illumination."

MR. F. B. CROWELL, formerly Engineer to the Atlanta (Ga.) Gas Company, has engaged in business as Consulting and Contracting Engineer, with headquarters in the Gould Building, that city. Those who need the service of a man well qualified to design and erect gas plants and power stations will find in Mr. Crowell an engineer up to any of their requirements.

AN odd accident reported from Spring Valley, Ills., last month is this: "Last night at a street fair in the village of Ladd, John Jordan, an engineer on the Chicage, Milwaukee and St. Paul Railway, was passing by a fish fry and when the proprietor stepped out to announce that the fish supper was ready and tapped on a gas drum to arouse further attention, the drum exploded with a loud report and Jordan was so seriously injured that one of his legs had to be amputated. Several tents nearby were disrupted."

SOME days ago the Gas Consumers Association, of St. Louis, Mo., against which the Laclede Gas Light Company secured a permanent injunction in Judge Fisher's Court, restraining it from disconnecting the Company's pipes in order to attach its regulators to control the flow of gas, went into court and obtained from Judge Fisher a modified order, whereby the Association is enabled to disconnect the Company's pipes and attach the regulators to the house pipes, after giving 3 days' notice to the Company. The house owner, or occupant, must notify the Company before the regulator is put on, in order that the Company may send an expert gasfitter to reconnect the pipes. If the Company fails to send a man then the house owner or occupant may disconnect the pipes and attach the regulator on the house pipe himself, provided the work is properly done.

AT a meeting of the Real Estate Taxpayers' Association held last month in their meeting room in Portland, Me., the following matter was tabled for consideration later on:

"*Whereas*, The city of Portland owns 1,700 shares of the Portland Gas Light Company (about ⅓ of the total capital stock) of the par value of $50 per share, or $85,000, and a market value of $90 to $100 per share, or from $160,000 to $170,000 nominal market or cash value, and

"*Whereas*, It is the duty of the municipal government of the city of Portland to carefully protect the interests of the people en masse and legislate for their welfare in general, and

"*Whereas*, The cost per 1,000 cubic feet to the consumer of gas in the city of Portland ranges from 40 to 100 per cent. in excess of the price charged in many other cities of the United States and Great Britain; and

"*Whereas*, The city of Portland is more favorably situated than many of the municipalities referred to in the United States and New England for the production of low cost gas for illumination and domestic purposes, now

"*Therefore*, this non-partisan association urges the city government of Portland to secure a thoroughly reliable and competent expert (who should be a non-resident of Maine) to examine, test and report his findings as to the cost and quality (candle power) of gas at the gasometer and the cost of delivery to the consumers in the city of Portland."

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JULY 1, 1907.

The Market for Gas Securities.

Prices were a trifle firmer in quotations for city gas shares last week, but the trading was next to nothing. Consolidated is 118 to 120, and the surface indications are for better prices. Master Masten's findings have been formally issued, and the volume is certainly worth reading, although we suppose it will not find great favor with the papers which Mister Hearst is said to edit.

Brooklyn Union is 110 to 112, and it surely looks good from either a speculative or an investment point of view. Peoples, of Chicago, is going on evenly, and the same may be said of Massachusetts gas. The latter, as per the last dividend declared, is still on a 3 per cent. basis. The 1¼ quarterly on Boston Consolidated is payable the 1st prox. The Eastern Companies are all making a very good showing.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies	Capital	Par.	Bid.	Asked.
Consolidated	$73,177,000	100	118	120
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	1,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	2,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000		98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	100	112
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,850	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106½
Cincinnati Gas and Electric Co.	29,500,000	100	98	99x
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	87	88
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co.	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	351,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,295,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107¼	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co.	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,222,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	100	103¾
" 6 per cent. scrip, due 1910	100,000	25	76	83
Massachusetts Gas Companies of Boston	25,000,000	100	57½	58
Preferred	25,000,000	100	80	80½
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	90⅞	91¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000		104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	340	345
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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., June 12, 1907.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 15th, 1907, to stockholders of record at the close of business, June 29, 1907. Checks will be mailed.

1671-4 LEWIS LILLIE, Treasurer.

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Position Wanted.

A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.

Address, "P. T. A.,"
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Must have works' and office experience. Wages, $1,000 per annum, with prospects. Send references.

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A Gas Maker for Coal Gas Plant in Central Part of State.

None but one giving best of references need apply. Address,

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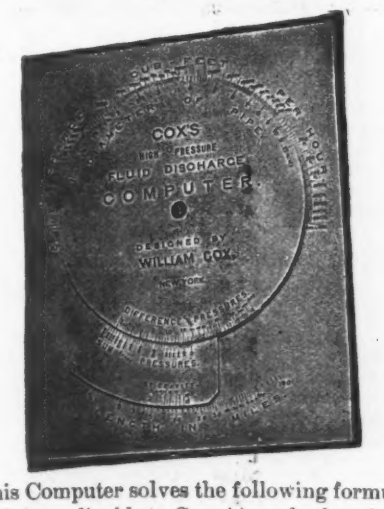
Cox's High Pressure Fluid Discharge Computer.



This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

(4.) Opposite any desired discharge will also be found the required diameter of pipe.

Price of the Computers, in Cloth Case, 6½ x 8 inches, $5 Each, Net.

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By G. LIECKFELD, C.E.

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M. J. LOXLEY COMPANY,

BANKERS,

Land Title Building, Philadelphia, Pa.

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IMPROVED AMMONIA CONCENTRATOR.

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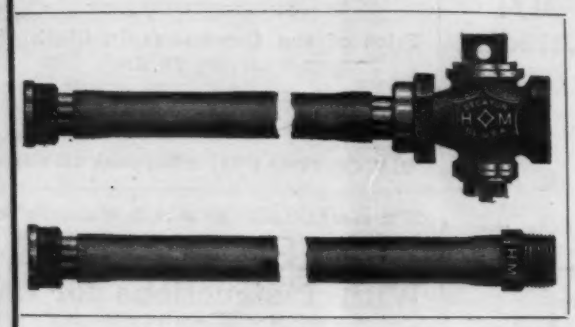

The same quality of material enters into the Three Patterns, each in its class being the best that experienced workmen and modern appliances can produce. You will never need but one set for a meter.

THEY WILL LAST FOR A LIFETIME.

The joints are perfectly made, connections are of good length and fittings are of Mueller Manufacture. Each Connection is rigidly inspected.

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Now in use in the United States and Europe

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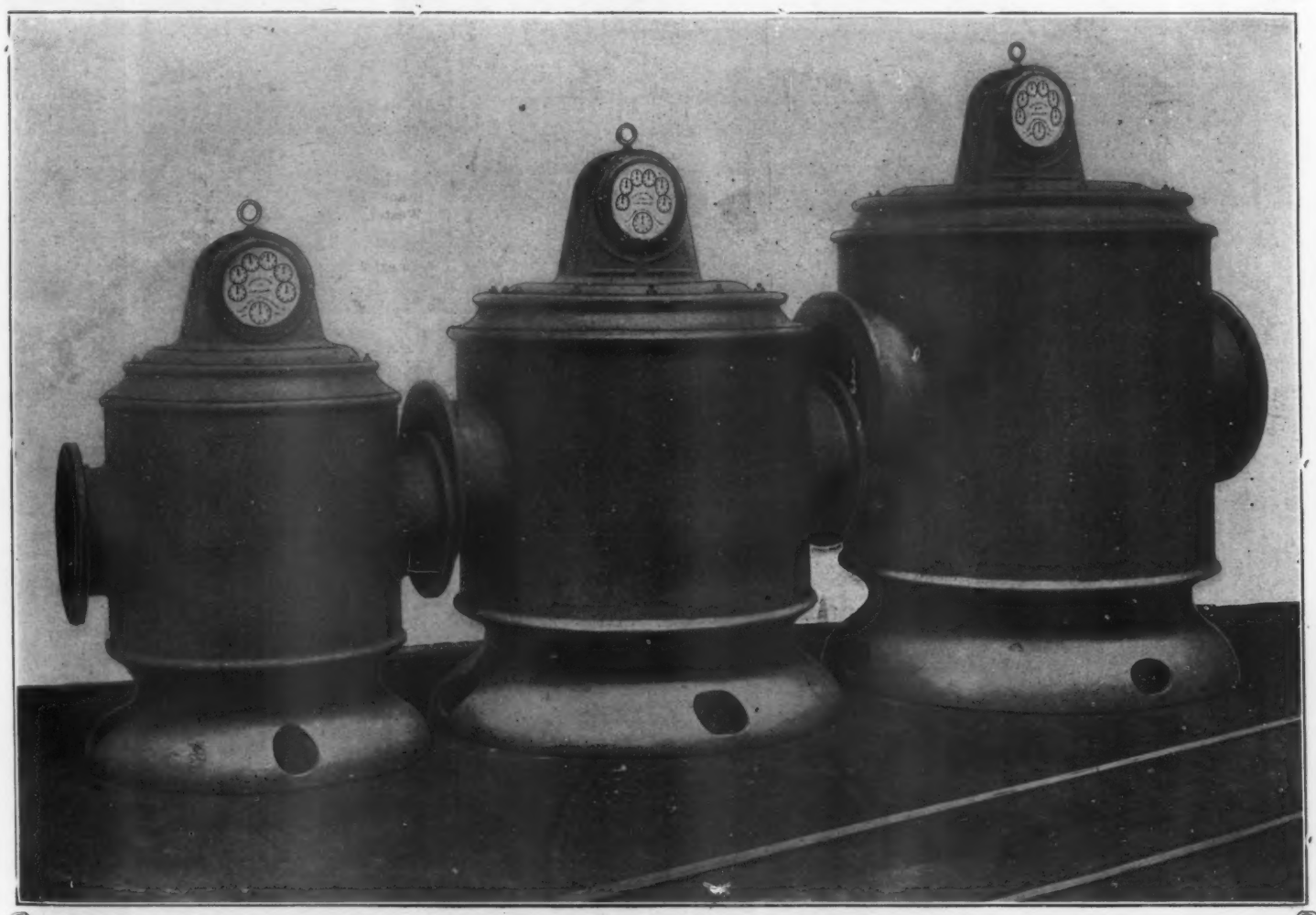

30,000 cu. ft. per hour.	45,000 cu. ft. per hour.	60,000 cu. ft. per hour.
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40-inch face to face flanges.	52-inch face to face flanges.	58-inch face to face flanges.
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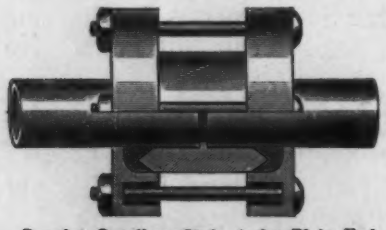

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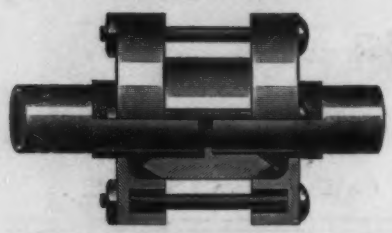

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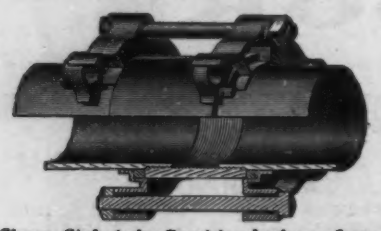

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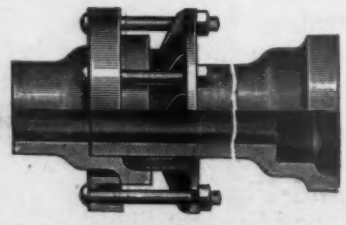

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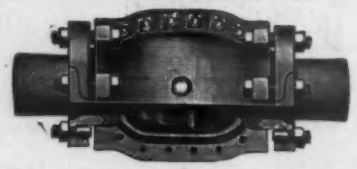

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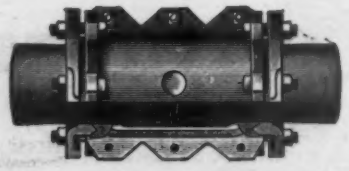

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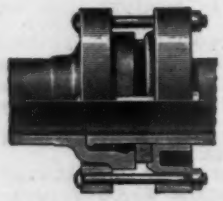

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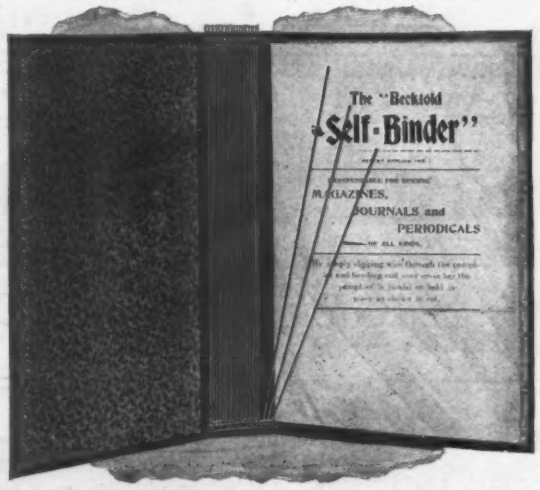

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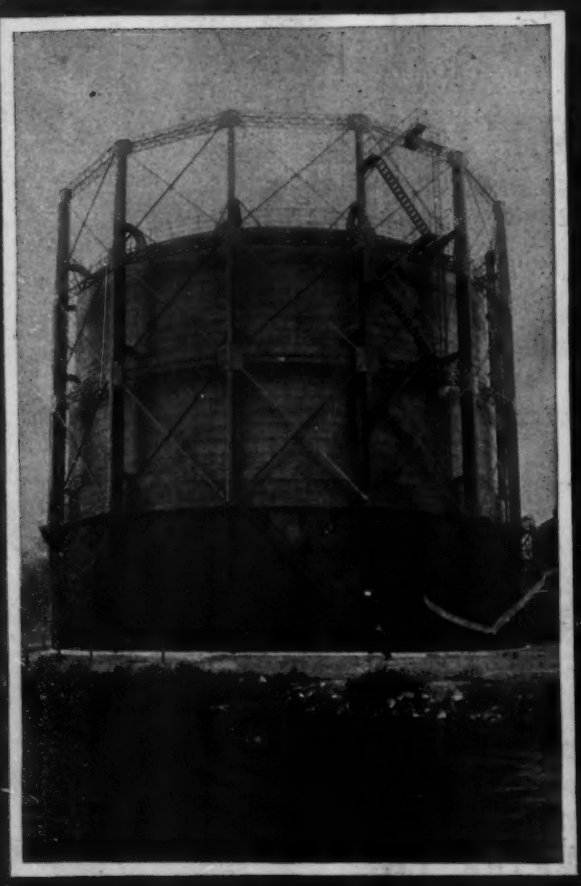

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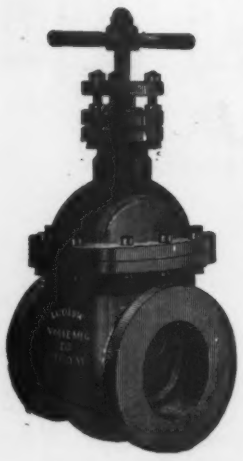

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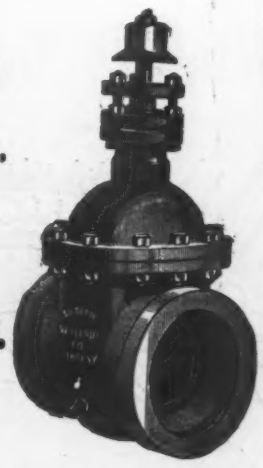

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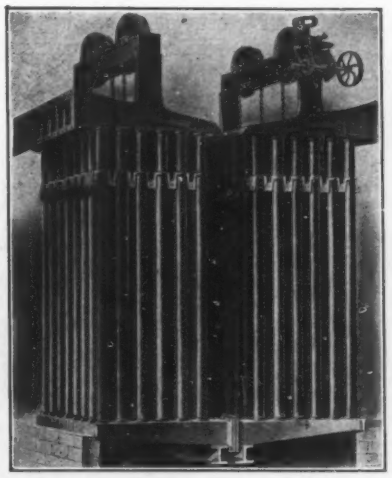

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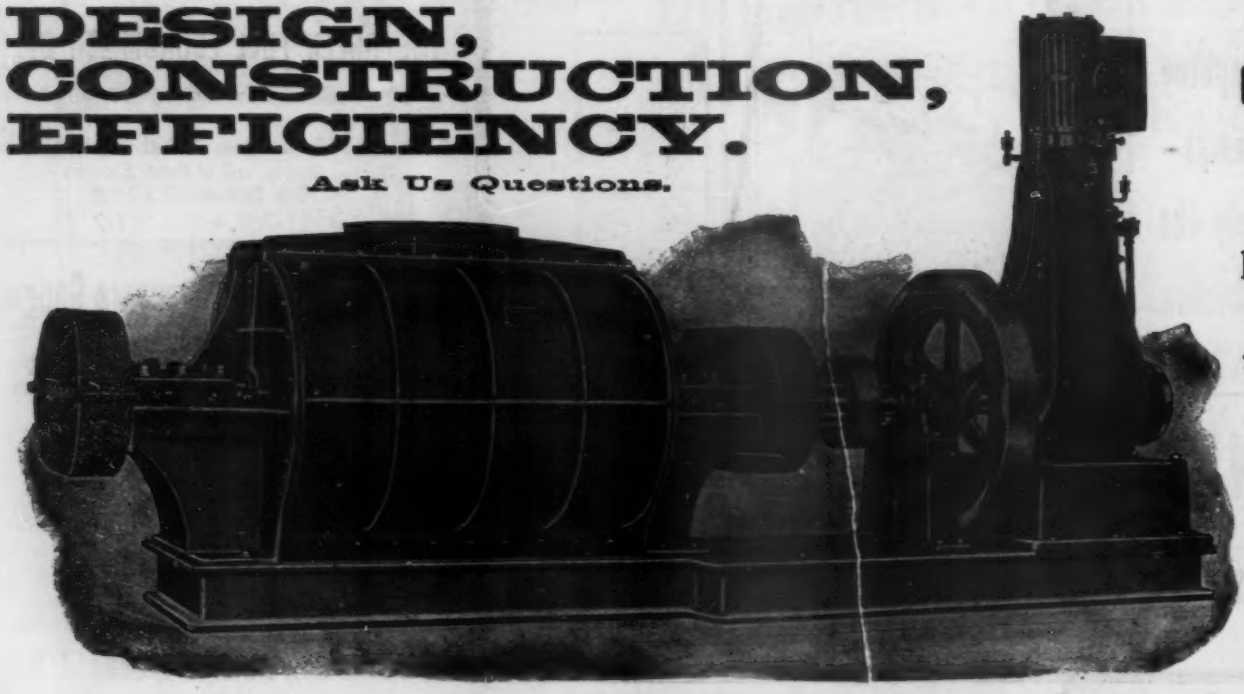

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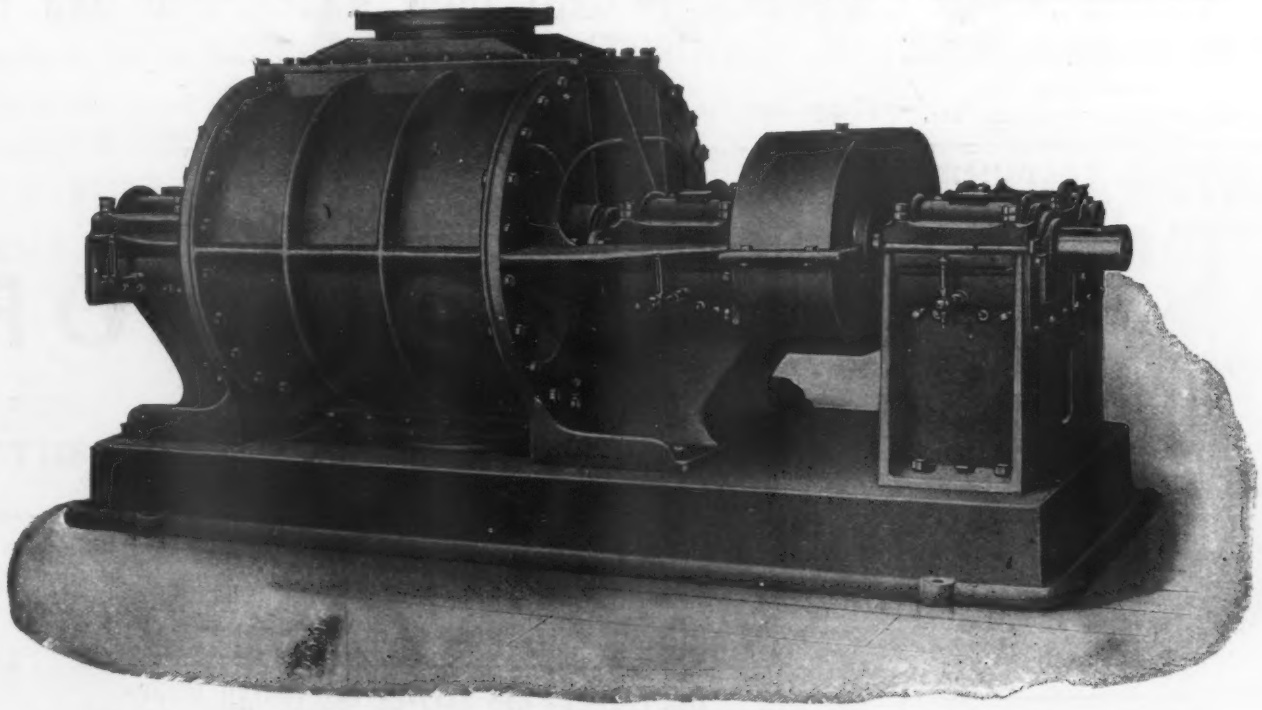

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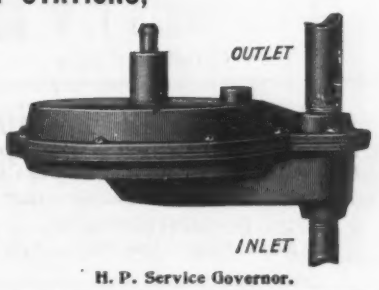

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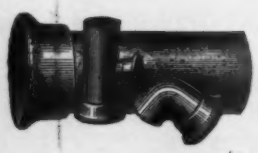

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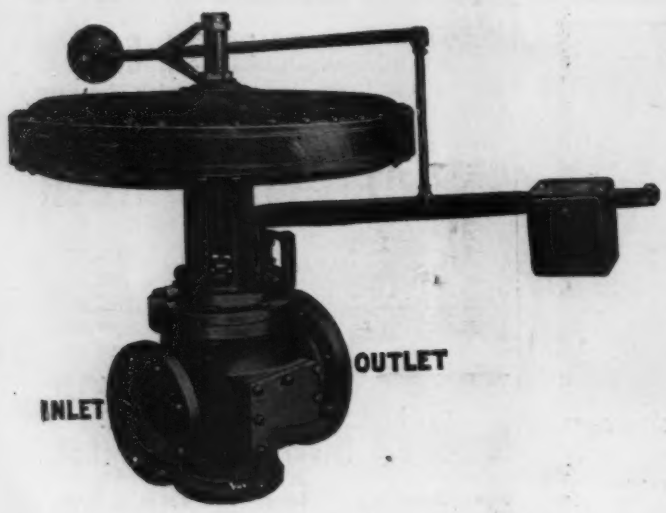

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PUBLIC LIGHTING TABLE.

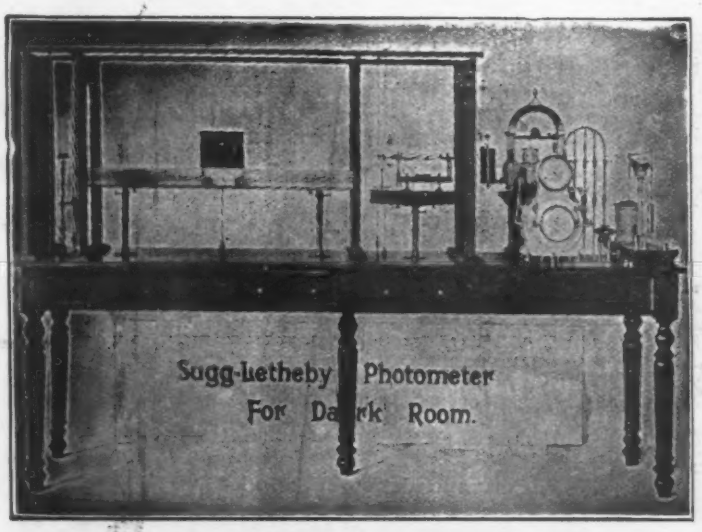
JULY, 1907.

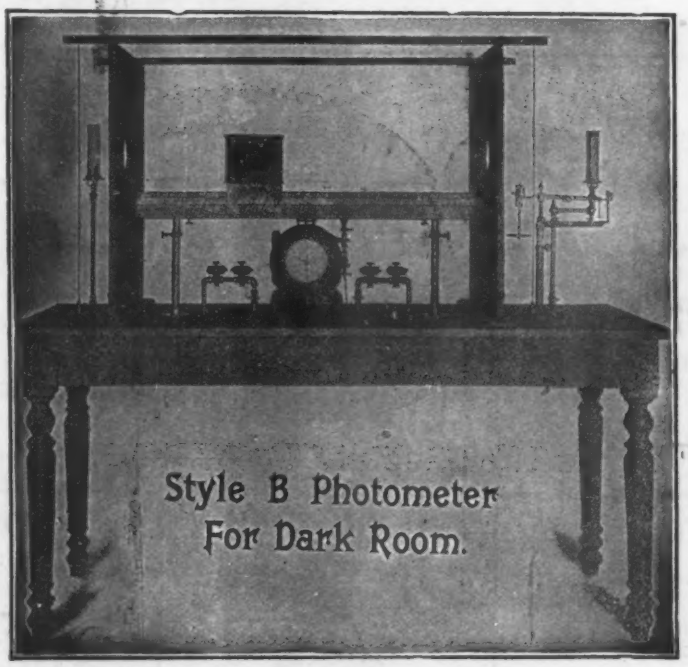
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Mon.	1	8.00 PM	1.00 AM
Tue.	2	8 00 LQ	1.30
Wed.	3	8 00	1.50
Thu.	4	8.00	2.20
Fri.	5	8.00	2.50
Sat.	6	8.00	3.30
Sun.	7	8.00	3.40
Mon.	8	8.00	3.40
Tue.	9	8 00	3.40
Wed.	10	8.00 NM	3.40
Thu.	11	8 00	3.40
Fri.	12	8.00	3.40
Sat.	13	8.00	3.40
Sun	14	8 00	3.40
Mon.	15	9.30	3.40
Tue.	16	10.00	3.40
Wed.	17	10.30	3.40
Thu.	18	11.00 FQ	3.40
Fri.	19	11.40	3.40
Sat.	20	12.10 AM	3.40
Sun.	21	1.00	3.50
Mon.	22	2.00	3.50
Tue.	23	No L.	No L.
Wed.	24	No L FM	No L.
Thu.	25	No L.	No L.
Fri.	26	7.50 PM	9.40 PM
Sat.	27	7.50	10.20
Sun.	28	7.50	10.50
Mon.	29	7.50	11.30
Tue.	30	7.50	12.00
Wed.	31	7.50 LQ	12.20 AM

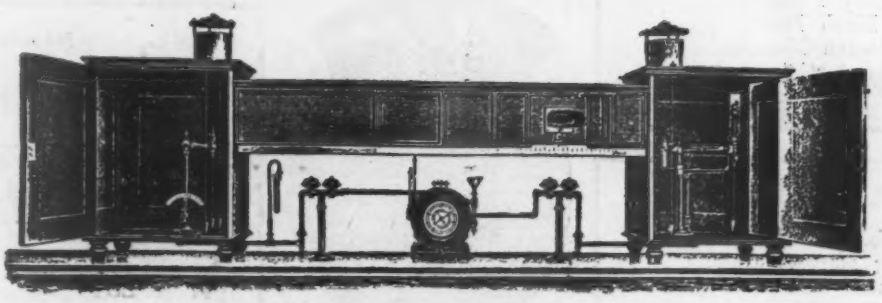
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs. Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







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PUBLIC LIGHTING TABLE.

JULY, 1907.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Mon.	1	7.30	3.15
Tue.	2	7.30	3.15
Wed.	3	7.30	3.15
Thu.	4	7.30	3.15
Fri.	5	7 30	3.15
Sat.	6	7.30	3.15
Sun.	7	7.30	3.15
Mon.	8	7.30	3.15
Tue.	9	7.30	3.15
Wed.	10	7.30	3.15
Thu.	11	7.30	3.15
Fri.	12	7.30	3.15
Sat.	13	7.30	3.15
Sun.	14	7.30	3.15
Mon.	15	7.30	3.15
Tue.	16	7.20	3.15
Wed.	17	7.20	3.15
Thu.	18	7.20	3.15
Fri.	19	7.20	3.15
Sat.	20	7.20	3.15
Sun.	21	7 20	3.15
Mon.	22	7.20	3.15
Tue.	23	7.20	3.15
Wed.	24	7.20	3.15
Thu.	25	7.20	3.15
Fri.	26	7.20	3.15
Sat.	27	7 20	3.15
Sun.	28	7.20	3.15
Mon.	29	7.20	3.15
Tue.	30	7.10	3.30
Wed.	31	7.10	3 30

TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs. Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.47

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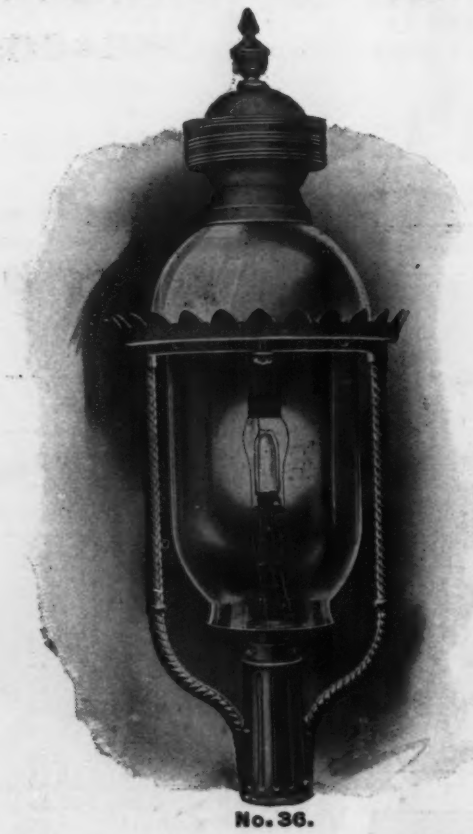

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Seattle, Wash. (2d contract).
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Waterbury, Conn.
Manchester, N. H.
Allentown, Pa.
Omaha, Neb.
Muskegon, Mich.
Nazareth, Pa. (2d contract).
Lewistown, Pa.
Greenville, Tex.
New York, Cent. Un. (3d contract).
Jefferson City, Mo.
Peekskill, N. Y. (2d contract).
Waterville, Me.
Washington, D. C. (4th contract).
Lawrence, Mass. (3d contract).
Hampton, Va.
Aurora, Ills. (2d contract).
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Syracuse, N. Y. (2d contract).
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TOTAL SETS INSTALLED IN 1906, ... 41
TOTAL SETS TO DATE, ... 634
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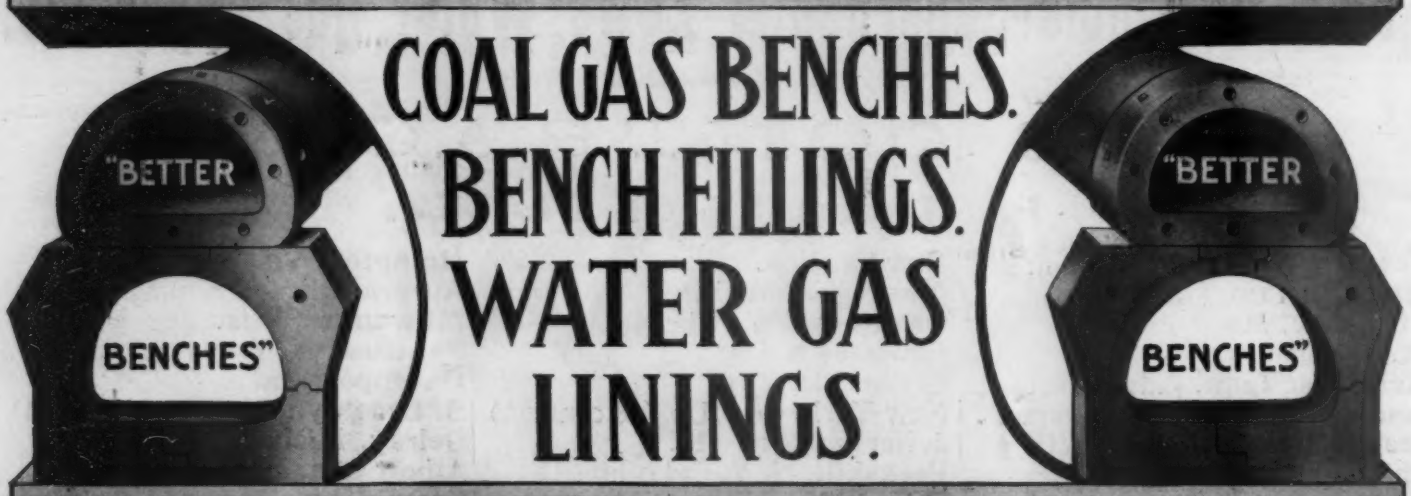

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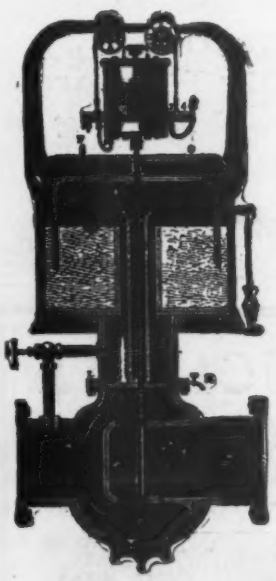

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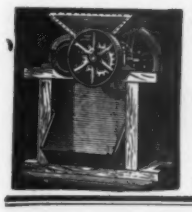

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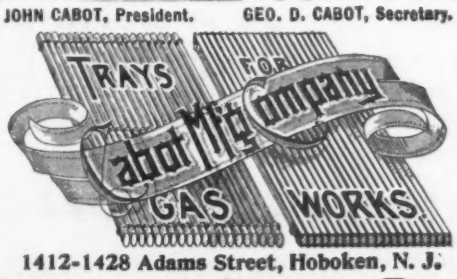

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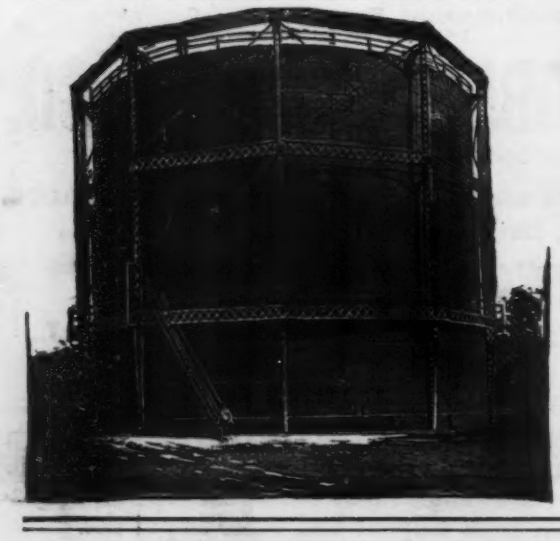

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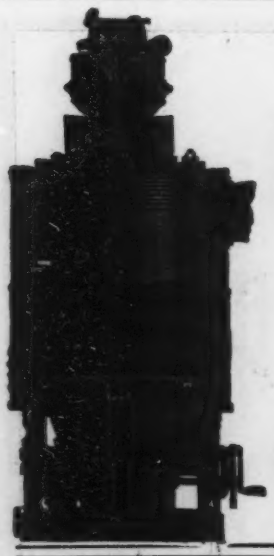

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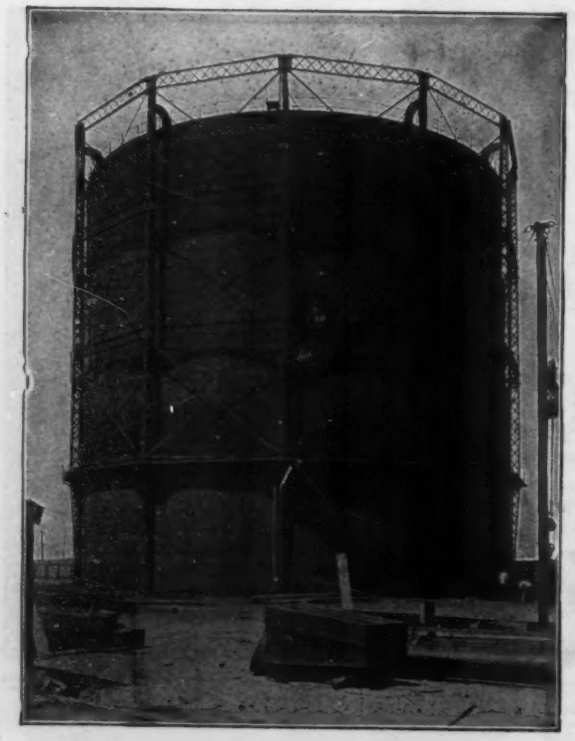

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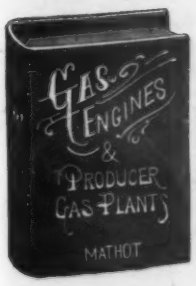

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